RNI. UPENGG/2006/23867 ISSN - 0974 - 5033

Vol. 12 January - June, 2017 No. 1

Journal of Natural Resource & Development

A REFEREED NATIONAL JOURNAL
OF
AGRICULTURE AND SCIENCE

online @ : www.jnrdalld.com

NAAS RATING : 3.46

SOCIETY OF BIOLOGICAL SCIENCES AND RURAL DEVELOPMENT
10/96, Gola Bazar, New Jhusi, Allahabad - 211 019 (U.P.), INDIA

Vol. 12 | January - June, 2017 | No. 1

Abstracted in CABI, U.K.

Journal of Natural Resource And Development

Abbreviated title of Journal : *Jour. Nat. Res. Dev.*

NAAS RATING : 3.46

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Journal of Natural Resource and Development 12 (1) 1-4, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

FARM PERFORMANCE OF MEAT TYPE EXOTIC BREEDS OF RABBITS UNDER TEMPERATE CONDITIONS OF KASHMIR VALLEY

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Received : 10.12.2016 *Accepted : 15.02.2017*

ABSTRACT

A total of 689 records of different breeds of rabbit maintained at Government Angora Rabbit Farm, Wusan- Pattan, District Baramulla, and J & K India. for 3 years (2009-2011) were analyzed to estimate the performance of growth traits in relation to genetic and non-genetic factors viz., breed, and sex on birth weight, weaning weight, and adult weight on different breeds of rabbit under study. The overall birth weight, weaning weight and adult weight was found to be 0.535 ± 0.0123kg (102), 1.342 ± 0.0146kg (102) and 4.074 ± 0.0653kg (102) respectively and the variability was found to be 23.18% and 10.95% and 16.18% for Soviet Chinchilla, 0.522 ± 0.00922kg (167), 1.344 ±0.011 kg (167) and 4.059 ±0.0498 kg (167) and the variability was found to be 22.80 %, 10.64% and 15.87% for Grey Giant, 0.489 ± 0.01 kg (118), 1.35 ± 0.0125 kg (118) 3.283 ± 0.048 kg (118) and the variability was found to be 22.29%, 10.07%, and 15.87% for California, and 0.542 ± 0.0126 kg (100), 1.357 ± 0.0146 kg (100), and 4.066 ± 0.065 kg (100) and the variability was found to be23.25%, 10.76%, and 15.99% for New Zealand White. Breed was found to have significant effect (P<0.01) on birth weight, weaning weight and annual weight but effect of sex was found to be non-significant on birth weight, weaning weight and annual weight.

Key words: Kashmir, meat breed rabbits, production performance, temperate climate,

INTRODUCTION

A domestic rabbit or domesticated rabbit, more commonly known as simply a rabbit, is any of the domesticated varieties of the European rabbit species Breeds such as the New Zealand and Californian are frequently utilized for meat in commercial rabbitries. These breeds have efficient metabolisms and grow quickly; they are ready for slaughter by approximately 14 to 16 weeks of age. Rabbits seem to have a good potential as a meat producing animal, especially when its productive and reproductive ability is considered (ElRaffa, 1994). A breeding gain in a rabbit flock depends on the breeding value (BV) of the selected individuals. The breeding value of an individual concerns the genetic merit that an individual transmit to its offspring (Chapman, 1985). Genetic evaluation for economic traits in rabbits is required and genetic parameters should be estimated without any bias. Some authors have made studies on genetic parameters of several traits of rabbits. Khalil et al (2013) made an important review article on this subject. However, most of these studies have used the sire or dam model of analysis.

MATERIALS AND METHODS

The data were obtained from the records of 689different breeds of rabbitmaintained at Government Angora Rabbit Farm, Wusan- Pattan, District Baramulla, and J & K India. The data were spread over a period of three years i.e. from 2009 to 2011. The growth traits studied were birth weight, weaning weight and annual weight.

The mean, standard errors and coefficient of variations (CV) were computed statistically.The effects of genetic and non-genetic factors such as breed and sex on these growthtraits were analyzed by least squares analysis using the technique developed by Harvey (1990). The following model was used for present investigation with assumptions that the different components being fitted into the model were linear, independent and additive.

$$Y_{ijk} = \mu + R_i + S_j + e_{ijk}$$

Where,

Y_{ijk} = k^{th} record of individual of i^{th} Ram of j^{th} sex

μ = Overall population mean

R_i = Random effect of i^{th} ram

S_j = Fixed effect of j^{th} sex

e_{ijklm} = Error associated with each observation and assume to be normally and independently distributed with mean zero and variance $(0, \sigma^2_e)$

Table 1. Average Temperature and Humidity for the period of 2009-2011

Month	Temperature		Relative Humidity%
	Maximum°C	Minimum°C	
January	7	-2	82
February	8.2	-0.7	79
March	14.1	3.4	70
April	20.5	7.9	64
May	24.5	10.8	61
June	29.6	14.9	56
July	30.1	18.1	66
August	29.6	17.5	70
September	27.4	12.1	67
October	22.4	5.8	69
November	15.1	0.9	77
December	8.2	-1.5	84
Average	19.725	7.266	70.416

RESULTS AND DISCUSSION

The least square means for birth weight, weaning weight and annual weight along with their standard errors are presented in Table 1 and Table 2.The average birth weight, weaning weight and adult weight was found to be 0.535 ± 0.0123kg (102), 1.342 ± 0.0146kg (102) and 4.074 ± 0.0653kg (102) respectively for Soviet Chinchilla, 0.522 ± 0.00922kg (167), 1.344 ±0.011 kg (167) and 4.059 ±0.0498 kg (167) for Grey Giant, 0.489 ± 0.01 kg (118), 1.35 ± 0.0125 kg (118) 3.283 ± 0.048 kg (118) for California, and 0.542 ± 0.0126 kg (100), 1.357 ± 0.0146 kg (100), and 4.066 ± 0.065 kg (100) for New Zealand White. Similar findings of 0.5 kg birth weight and lower estimate of 0.6-0.7 weaning weight were observed by Sivakumar et al., (2013) in Soviet Chinchilla and also lower estimate of 0.6-0.7 kg weaning weight and 1.8-1.9 kg adult weight were observed by Ghosh et al., (2008) in Newzealand White and Soviet Chinchilla breeds of rabbit. On contrary lower estimates ranged from 0.3-0.4 kg birth weight whereas higher estimate of 2.1-2.2 weaning weight were observed by Olonofeso et al., (2012) in three breeds of rabbit. The lower estimate of adult weight ranging from 2.2-2.5 kg were observed by Khalil et al., (2013) in Baladi Red and Newzealand White breeds of rabbit. Similar findings of weaning weight 0.7-1.3 kg were observed by Adelodun (2015) in four breeds of rabbit.Breed was found to have significant effect (P<0.01) on birth weight, weaning weight and annual weight but effect of sex was found to be non-

significant on birth weight, weaning weight and annual weight. Similar findings of significant effect of breed on live litter body weight of Rabbit in Mina, Niger State, Nigeria were observed by Egenal et al.,(2012) and significant effect of genotype and parity and non-significant effect of sex on individual kit weight in rabbit breeds and thier crosseswere reported by C.A Chineke (2005).On contrary, breed having non-significant effect on individual weaning weight on local rabbits of subtropical climate were reported by Ghosh et al. (2008).

Table 2 Least squares means for birth weight, weaning weight and annual weight in different rabbit breeds

	Birth weight (Kg)	Weaning weight (Kg)	Annual weight (Kg)
Overall	0.478 ± 0.004	1.220 ±0.005	3.418 ±0.022
Breed	**	**	**
Soviet Chinchilla	0.535^{b} ± 0.011	1.342^{b} ±0.013	4.074^{b} ± 0.055
Grey Giant	0.522^{b} ± 0.008	1.344^{b} ±0.010	4.059^{b} ± 0.043
California	0.488^{ab} ± 0.010	1.351^{b} ± 0.012	3.288^{ab} ± 0.052
New Zealand White	0.542^{b} ±0.011	1.357^{b}± 0.013	4.064^{b} ± 0.056
Sex	NS	NS	NS
Male	0.476 ± 0.006	1.223 ±0.007	3.435 ± 0.031
Female	0.479 ±0.006	1.217 ±0.007	3.400 ± 0.031

**P<0.01
NS- Non significant
Means with different superscripts differ significantly

Table 3. Least-squares means ± SEM for growth traits of different rabbit breeds (sex- wise comparison)

	Soviet Chinchilla			Grey Giant			California			New Zealand White		
	NS			NS			NS			NS		
Traits	Male (51)	Female (51)	Overall	Male (83)	Female (84)	Overall	Male (43)	Female (75)	Overall	Male (57)	Female (43)	overall
BT (Kg)	0.525 ± 0.0178	0.544 ± 0.017		0.531 ± 0.014	0.514 ± 0.013		0.475 ± 0.017	0.497 ± 0.013		0.539 ± 0.017	0.545 ± 0.019	
WT (Kg)	1.335 ± 0.021	1.349 ± 0.021		1.353 ± 0.016	1.336 ± 0.015		1.358 ± 0.021	1.345 ± 0.016		1.356 ± 0.020	1.358 ± 0.022	
AwT (Kg)	4.092 ± 0.095	4.055 ± 0.091		4.075 ± 0.070	4.034 ± 0.071		3.330 ± 0.079	3.256 ± 0.060		4.095 ± 0.088	4.028 ± 0.098	

NS-non-significant
The effect of sex on traits with the breed was non-significant (P<0.05).
Figures in parenthesis are number of observations

CONCLUSION

The present study has fucussed on improving the meat production options by screening four breeds of meat type rabbits under temperate climatic conditions of Kashmir region in J&K. The purpose is to explore the option of incresing meat production using some unconventional means like Rabbits, which may be an important income generating subsidiary occupation among the farmers specially farm-women. For overall improvement of Rabbit production and a profitable enterprise, the performance level needs to be established for various genetic groups under local climatic conditions. Birth weight, weaning weight and annual body weight is an important phase in meat type rabbits. From the results of present study it may be concluded that the birth weight and weaning weight among the four breeds was higher in New Zealand White and the annual body weight gain was slightly higher in Soviet Chinchilla, whereas, the sex

has the effect (male) on overall annual body weight/growth among all the breed, hence, adopting the selection of sovitet chinchilla breed for meat production can attain improvements under present climatic conditions.

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Journal of Natural Resource and Development 12 (1) 5-10, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

TAXONOMY AND MORPHOLOGY OF CYANOBACTERIA THE GENUS HAPALOSIPHON (STIGONEMATALES)

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Received : 15.01.2017 *Accepted : 17.02.2017*

ABSTRACT

Hapalosiphon **belong to the order Stigonenametales which have complicated morphology and hetertrichous filamentous organization with heterocysts. Presence of uniseriate filaments throughout life span is a characteristic feature of *Hapalosiphon*. Four strains of *Hapalosiphon* which were collected from different paddy fields of U.P. were studies in detailed for various morphological experiments such as growth pattern, cell size, heterocysts and perennation mechanism etc. Distinction of four strains based on the thickness of filaments and appearance of the thallus on the solid agar surface and on liquid medium. All the four selected strains shows great diversity in their characteristic. These four strains have been grown in culture medium and it was found that *Hapalosiphon*.-196 was broadest; *Hapalosiphon*.-350 was thinnest where as *Hapalosiphon*.-53 and *Hapalosiphon*.384 showed medium sized filaments. *Hapalosiphon*.-53 –dotted diffused thallus, filament shows pedicellate heterocyst. *Hapalosiphon*.-196 Cushion like thallus, broad filament, *Hapalosiphon*.-350 spreaded thallus, filament thinnest, swollen tips. *Hapalosiphon*.-384 discreet thallus with raised and uneven upper surface.**

Key words: *Hapalosiphon*, growth pattern, perennation, germination

INTRODUCTION

Among Stigonenametales the genus *Hapalosiphon* stand as one of the most commonly occurring genera which has uniseriate filament throughout life span. The genus *Hapalosiphon*. was initiated taxonomically by the monograph by Bornet and Flahault (1986-1988). Tiwari (1973) describe a new species of *Hapalosiphon*. i.e. *Hapalosiphon. fertillissima* this species was isolated from enrichment culture of paddy fields soil collected from Karjat (Maharastra). This species differ from the other species of *Hapalosiphon*. (Geitler 1932 and Desikachary 1959) in the prolific formation of akinetes and their *in-situ* germination. Presently occurrences of different species of h in the paddy field soil have been described by many Indian workers (Banerji 1935, Singh 1939, 1942, 1961 De 1939, Mitra 1950, 1951, Pandey 1962 and Singh 1961).

Present paper discuss in detailed the morphological characters of four different species of *Hapalosiphon* with their isolation in unialgal and exenic culture because culture studies make it possible to assess the morphological characterization in strains. (Stam and Hollmon 1979, Komerak 1972, Whitton 1971)

MATERIALS AND METHODS

The strains of *Hapalosiphon* were available in phycology laboratory, Department of Botany, University of Allahabad. This strain was maintained in our germplasm collection of Cyanobacteria under controlled laboratory conditions. The strains of *Hapalosiphon* were axenic and cloned from single few celled colonies. It was grown in BG-11 medium (Stanier *et al*., 1971) solid and liquid nitrogenous and nitrogen deficient medium to study its morphology and growth behavior under culture conditions. After incubation into culture tube and

agar plates it was incubated in culture chamber under controlled laboratory condition (14: 10 h, L: D 28 ± 2°C at 3000 lux light intensity provided by fluorescent tube). Culture was maintained for one year for regular observations. Growth, development and other morphological observations were closely mentioned. Such observations were made with the help of Nikon Labaphat-2 Microscope and Nikon 35 camera from freshly prepared slide

RESULTS AND DISCUSSION

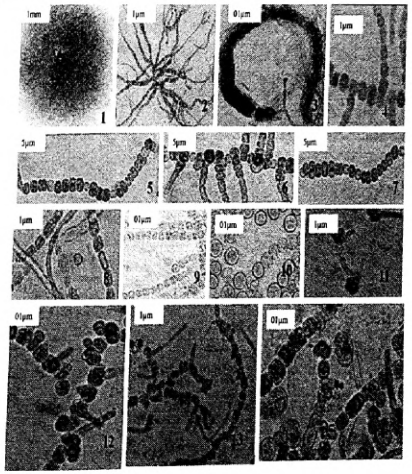
In nature it was very difficult to identify these *Hapalosiphon* strains at specific level, but in culture these strains showed very characteristic thallus organization on the basis of their thallus structure it can be easily separated at specific level. All the four selected strains of *Hapalosiphon* showed very peculiar characteristics. All strains shows uniseriate filament throughout life span, which is a characteristic feature of *Hapalosiphon*.

FEATURES			*Hap.* 53	*Hap.*196	*Hap.*350	*Hap.*384
—	Colour	In young stage	Bright blue-green	Dark blue-green	Dark blue-green	Dull blue-green
		At maturity	Yellowish	Dull blue-green	Yellowish	Yellowish
	Growth Pattern	In solid medium	Dotted diffused	Cushion like	Discrete scattered colonies	Expanded colonies indefinite in shapes
		In liquid medium	Floating growth under submerged condition in a form of a cloth like mat	Initially bottom attached but later free floating bushy growth	Attached to the wall and bottom of the flask.	Firmly attached to the wall and bottom of the flask.
	Margin		Diffused	Fringed	Broken	Diffused
FILAMENTS			Uniseriate 7.5-9μ m broad	Uniseriate 11-12.5 μ m broad	Uniseriate 6.5μ m broad	Uniseriate 7.5-8.5μ m broad
BRANCHES	True lateral-T shaped		*Hapalosiphon* type	*Hapalosiphon* type, *Westiella* type	*Hapalosiphon* type	*Hapalosiphon* type
	False		Occasionally present	Absent	Absent	Absent
	Apical cell		Tapering	Tapering	Club- shaped	Tapering
HETEROCYSTS			Intercalary, terminal, paired, occasionally pedicellate, pale yellow in colour	Intercalary, terminal, paired, pale yellow in colour	Intercalary, terminal, paired,, pale yellow in colour	Intercalary, terminal, paired, pale yellow in colour
HORMOGONES	Shape		Straight	Straight	Straight	Straight
	Size (Celled)		4-16 celled long	4-5 celled long	8-10 celled long	6-20 celled long
	Liberation		From the tip of lateral branches,	From the tip of lateral branches	From the tip of lateral branches	From the tip of lateral branches
	Germination		Isopolar and heteropolar	Isopolar	Isopolar and heteropolar.	Isopolar and heteropolar
AKINETES	Shape		Spherical	Spherical,	Spherical, sub spherical, egg shaped	Spherical or oblong
	Size		10-10.5μm in diameter	10-12.5μm in diameter,	8.5-12.5μm long, 5-7.5μm broad	6.5-7μm in diameter, or 7.5-9μm long, 5-7.5μm broad
	Colour		Pale yellow	Dull blue-green	Pale yellow	Pale yellow
	Germination		'in-situ', or liberate germling by division of akinete contents	Liberate germling by rupturing of parent wall.	Liberate germling by division and forms terminal heterocyst	Packet formation

TABLE-3.3Comparative Morphological characters of different species of *Hapalosiphon*

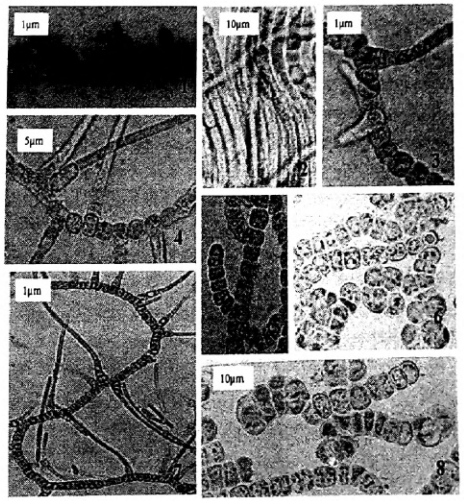
The important morphological characteristic of these strains are mentioned in the following table.

***Hapalosiphon*.--53** in culture on solid surface it produced dotted diffused colonies which do not aggregate over each other (Fig-1). The thalli are bright blue green in colour with rough dotted appearance. In liquid medium it showed colonies grown under submerged conditions and formed cloth like mat. Filament uniseriate and are parallel with each other when young (Fig-3). Filament was 5.5 to 7.5 m long and 8.5 -9 m broad. Cell division takes place transversally as well as longitudinal filament showed lateral T shaped (*Hapalosiphon* type) true opposite branching. (Fig 6) sometimes false branching also present. Heterocysts intercalary, terminal, lateral sessile two and three pored. sometimes pedicellate heterocysts also present but rarely (Fig 4,8) hormogone straight thin which are 4-16 celled long liberated from the tip of the lateral branches and shows isopolar and heteropolar germination to form crescent shaped (*Comptyloneoid* stage) with intercalary heterocysts at regular intervals ant tapering at both the ends (fig-5,) or juvenile filament with terminal heterocyst at one end and tapering at another end.(Fig-7) At maturity akinetes are formed which are spherical and pale yellow in colour (Fig-9) which are 10-11 m in diameter akinetes are found in long chain which show in-situ germination (Fig 10-14) or liberate germinling by division of akinete contents.



***Hapalosiphon*.--53 Description of figs: (Fig.1-14),1.** Growth pattern, 2. Single filament showing branches and liberation of hormogones, 3. Young filaments forming bundles, 4. Filament with branching and pedicellate heteriocyst, 5. Crescent shaped Juvenile filamtnt with heterocysts (Camptylonioid stage), 6. Lateral T-shaped branching, 7. Germinating hormogones with terminal and intercalary heterocysts, 8. Filment with pedicellate heterocyst, 9. Mature cell before formation of akinetes 10. Mature akinetes, 11-14 Different stages of akinetes germination.

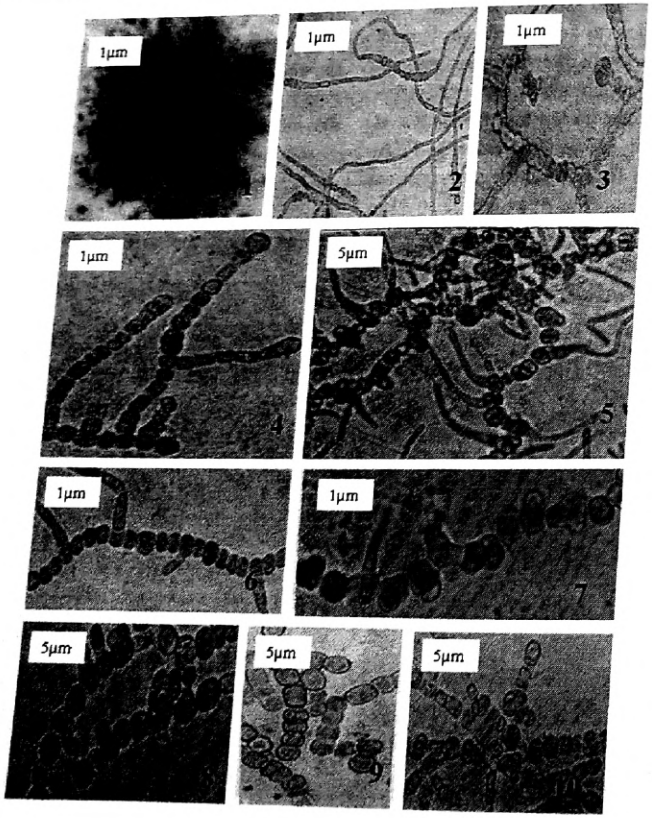
***Hapalosiphon*.-196** in culture on solid surface it produced dark blue green cushion like colonies with fringed margin (Fig-1). In liquid medium it showed colonies shows initially bottom attached but later free floating bushy growth. Filament heterotrichous uniseriate initially parallel with each sheath present which are hyaline (Fig-2). Filament are 11 to 12.5 m broad. Cell division takes place transversally as well as longitudinal filament showed lateral t shaped *Hapalosiphon* and *Westiella* type sometimes secondary branching also present it shows intercalary, two pored three pored heterocysts and heterocysts at the base of branching.(fig 3,4), lateral sessile as well as terminal heterocysts hormogone straight thin which are 4-5 celled long liberated from the tip of the lateral



branches and shows isopolar germination to form crescent shaped (*Comptyloneoid* stage) with intercalary heterocysts at regular with terminal heterocyst at one end and tapering at another end. At maturity akinetes are formed which are spherical and dull blue green in colour which are 10-112-5 m in diameter akinetes are found in long chain which germination by increasing in size and liberating germinling by ruptured of parent wall.(Fig 6,8)

***Hapalosiphon*.-196** Description of figs: (Fig.1-7), 1. Growth pattern, 2. Parellal filaments, 3. Filament showing emergence of branches, 4. Filament with three pored heterocyst and heterocyst at the base of branching, 5. Mature vegetative filament, 6. Akinetes, 7. Filament showing lateral branching, 8. Germination of akinetes

***Hapalosiphon*.-350** in culture on solid surface it formed discrete colonies with thick central part and lighter peripheral portion with diffused margin (Fig-1). The thalli are dull blue green in colour. In liquid medium it showed wall as well as bottom attached growth.. Filament uniseriate (Fig-).6.5 to 7.5 µm long and 5- 5.5 µm broad. Cell division takes place transversally as well as longitudinal filament showed lateral Tshaped (*Hapalosiphon* type) dichotomous opposite branching Secondary branching also presenttip of the lateral branching club shaped. hertercysts intercalary two and three pored, lateral sessile as well as terminal heterocysts heterocysts also present at the base of the branching. hormogone straight thin which are 8-10 celled long liberated from terminal end of the lateral branches and shows isopolar and heteropolar germination to form crescent shaped (*Comptyloneoid* stage) with intercalary heterocysts at regular intervals and terminal heterocyst at one end and tapering at

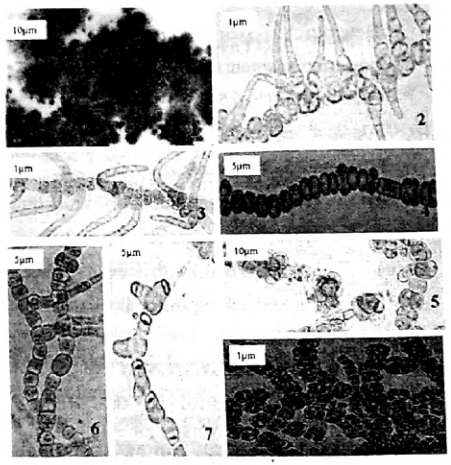


another end. At maturity akinetes are formed which are spherical and pale yellow in colour which are 10-11 m in diameter akinetes are found in long chain which show germination by division to liberate germinling.

***Hapalosiphon*.-350 Description of figs: (Fig.1-8),** 1. Growth pattern, 2. Hormogones and their germination (Camptylonioid stage), 3 and 4, Vegetative filament with lateral branching with swollen tip, 6. Filament with intercalary heterocyst at the base of branching, 9. Akinetes, 5,7,8 and 10 . germination of akinetes .

***Hapalosiphon*.-384** in culture on solid surface it formed expanded thallus that has bulging central part , have no definite shape and uneven surface (Fig-1). The thalli are dull blue green in colour. In liquid medium it showed formally wall and bottom attached colonies. Filament uniseriate. 7.5µm to 8.5 -9 µm broad. Cell division takes place transversally as well as longitudinal filament showed lateral T shaped (*Hapalosiphon* type) true opposite and secondary branching basal cell of the branching bulges. Heterocyst intercalary, lateral sessile as well as terminal heterocysts hormogone straight thin which are 6-20 celled long liberated from the tip of the lateral branches and shows isopolar and heteropolar germination to form crescent shaped (*Comptyloneoid* stage). At maturity akinetes are formed which are spherical and pale yellow in colour which are 6.5-7µ m in diameter akinetes are found in long chain (Fig-4)which germinate to liberate content of akinetes and then divide to form grmiling.(Fig-5,7,8)

***Hapalosiphon*.-384 Description of figs: (Fig.1-8),** 1. Growth pattern, 2.and 3. Young filament showing emergence of branching, 4. Chain of akinetes, 5. And 8 packet formation during akinetes germination, 6. Mature vegetative filament, 7. Germination of akinetes and formation of terminal heterocysts.



According to Desikachary 1959 *Hapalosiphon* Nag. Thallus caespitose, floccose, thin, aquatic, filaments free, not coalescing laterally, cells in one or two rows, sheath present, continuously branched, branches irregularly lateral true, often arising only on one side of the filaments, false branches present, branches erect form the primary prostrate filaments, erect branches as broad as and similar to the main filament, heterocysts intercalary, only occasionally lateral, hormogones formed mostly from the side branches, spores present.The main distinguished features are Sheath coloured or colourless, thin or thick.Lateral branching short or long.Lateral branches attenuated or not attenuated and the side branches narrow than main filaments or broader than main filaments. The present observation showed that genus has uniseriate filament through out life span, branching true occasionally false, lateral-T shaped, tip cell of lateral branching swollen or club shaped, heterocyst intercalary, terminal, lateral sessile occasionally pedicellate, three pored, paired, hormogones straight, germination of hormogones isopolar or heteropolar, juvenile filament crescent shaped or spiral, akinetes are formed.

Taxanomic characterization of the strains of *Hapalosiphon*

Heterotrichous filamentous habit ..... (Stigonematales)

Uniseriate filament throughout life span ..... (*Hapalosiphon*)

Filament thin (5- 6.5 mm broad) *Hapalosiphon*-350

Filament very broad (11.5- 12.5mm broad) ..... *Hapalosiphon*- 196

Filament 7.5- 9mm broad .....

(i) Dotted diffused thalli, false branching and some times pedicellate heterocysts ..... *Hapalosiphon* – 53

(ii) indefinite thalli with uneven surface, false branching and pedicellate heterocysts absent *Hapalosiphon*-384

ACKNOWLEDGEMENTS

Authors are thankful to the Head, Department of Botany, University of Allahabad, Allahabad for his keen interest and for providing necessary facilities.

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Journal of Natural Resource and Development 12 (1) 11-14, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

IN-VITRO EVALUATION OF CHEMICAL FUNGICIDES AND BIOAGENTS AGAINST PYTHIUM APHANIDERMATUM

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Received : 25.02.2017 *Accepted : 21.03.2017*

ABSTRACT

Chilli (Capsicum annum L.) is considered an important tropical and subtropical crop due to its high consumption, nutritional and economic value to farmers. Although India has a larger growing area, its productivity is low when compared to other countries due to high incidence of fungal and viral diseases. During the survey in the year 2014-15, among the fungal diseases, damping-off incited by *Pythium aphanidermatum* causes severe damage in nurseries. Twelve chemical fungicides of different and eight bioagents were evaluated separately against the pathogen *in-vitro*. Among all the tried chemical fungicides, Mancozeb (64%) + Metalaxyl (8%), Propioconazole and Tubuconazole were found most effective and inhibited 100% radial growth of *Pythium aphanidermatum*. In case of bioagents *Trichoderma koningii and Trichoderma harzianum* were found most effective for inhibition of test pathogen and it was 51.00% and 47.00%, respectively. However Thiophanate Methyle and Aspergillus niger gave poorest response in this experiments. Other fungicides and bioagents were also reduced the growth of *Pythium aphanidermatum*.

Key words: *Pythium aphanidermatum, Trichoderma harzianum, T. koningii, bioagents, fungicids.*

INTRODUCTION

Chilli (*Capsicum annum* L.) is considered an important tropical and subtropical crop on the basis of its high consumption, nutritional and economic values. India is the largest producer and exporter of chillies in the international market and exports dry chilli, chilli powder and oleoresins to over 90 countries. Although India has a large growing area but its productivity is low when compared to other countries due to sever attack of diseases. Among the fungal diseases, damping-off incited by *Pythium aphanidermatum* (Edson) Fitz. cause very severe damage in nurseries (Muthukumar et al. 2008). Management of *Pythium aphanidermatum*. Attempts were made to manage the damping-off using different fungicides. The indiscriminate use of fungicides resulted in the accumulation of residual toxicity in soil, environmental pollution and altered the biological balance in the soil by decimating the non-target and beneficial microorganisms. Development of fungicides resistance in the pathogen has also been reported (Bharathi et al. 2004). Keeping iv view the importance of crop and loss due to *P. aphanidermatum* the experiment were conducts with the objectives (1) To evaluate the antagonistic activity of fungal isolates against *P. aphanidermatum* in vitro, (2) To test the compatibility fungal pathogen against modern fungicides.

MATERIALS AND METHODS

Isolation of Pathogen:

Isolation, maintenance and identification of

pathogen diseased chilli seedlings with damping-off symptoms on collar region were collected and washed in running tap water. The specimen were cut into pieces (1 cm long), rinsed in sterile distilled water for three times, dry them with paper towel and then placed on 2% water agar (Huang and Lin 1998). After 48-hours incubation at 24°C–26°C, hyphal tips of fungi growing out from the collar region were cut and transferred into culture tubes having two percent solution of potato dextrose agar (PDA) medium (Ainsworth 1961) and stored at 24–26°C in a biological oxygen demand (BOD) incubator.

Evaluation of bio-agents against *Pythium aphanidermatum in-vitro:*

An attempt was made to test the antagonistic nature of various antagonists isolated samples collected from different places of Uttar Pradesh. These bioagents obtained from Biocontrol Lab, CSAUA&T, Kanpur. These isolates were evaluated against the pathogen following "dual culture technique" (Johnson and Curl, 1972). For this purpose, 20ml. of sterilized PDA was aseptically poured in sterilized Petri dishes and allowed to solidify. The 5 mm. discs from the culture of isolated bioagents and test pathogen were taken out with the help of sterilized cork borer from the edge of 7-days old cultures and placed opposite side in Petri dishes. Test pathogen inoculated Petri dishes served as control. These plates were incubated at 27 1°C in incubator. Each treatment was replicated thrice. Observations were recorded after 72 hours.

Screening of chemical fungicides against *Pythium aphanidermatum in-vitro:*

Twelve chemical fungicides belonging to different groups were screened *in-vitro* by the "Food Poison Technique" (Schmitz, 1930), against the pathogen under laboratory conditions. To find out their relative efficacy in inhibiting the growth of the pathogen. The data on radial growth of fungal colony was measured in mm after every 24 hours till the control petri plates were not filled up. The per cent inhibition over control was calculated by the following formula given by Bliss (1934).

$$\text{Per cent inhibition over control} = \frac{C - T}{C} \times 100$$

where,

C = Growth of fungus in control

T = Growth of fungus in treatment

RESULTS AND DISCUSSION

Evaluation of bioagents against Pythium aphanidermatum in-vitro:

Eight bio-agents were evaluated for their inhibiting effect against the pathogen in vitro by dual culture techniques as described above. The results of average diameter of fungal colony are presented in Table 1 & Fig 1.

Table-1: Inhibitory effect of different bio agents on the growth of *Pythium aphanidermatum* in *in vitro* at 27 ± 1°C.

S.No.	Bio-agents	Average radial of fungal colony (mm)	Percent inhibition
1.	*Trichoderma koningii*	14.66	51.13
2.	*Trichoderma harzianum*	15.66	47.80
3.	*Trichoderma longibrachiatum*	19.33	35.56
4.	*Pencillium notatum*	21.66	27.80
5.	*Trichoderma viride*	23.66	21.13
6.	*Trichoderma atroviride*	26.33	12.23
7.	*Aspergillus niger*	29.33	2.23
8.	*Chaetomium globosum*	21.33	28.90
9.	Control	30.00	-
	C.D. 5%	1.476	

It revealed from Table 1 and Fig 1 that all the bio-agents were effective to suppress the colony growth of *Pythium aphanidermatum*. Maximum suppression of the growth of pathogen was with *Trichoderma koningii* (51.13%) *followed by Trichoderma harzianum* (47.8%) and *Trichoderma longibrachiatum* (35.56%) which were statistically at with to each other. The other bio-agents in there descending order viz., *Chaetomium globosum* (28.9%), *Pencillium notatum* (27.8%), *Trichoderma viride* (21.13%) and *Trichoderma atroviride* (12.23%). *Aspergillus niger (2.23%) was found least effective.*

Screening of fungicide against Pythium aphanidermatum in-vitro:

Inhibitory effect of twelve chemical fungicides, growth of the pathogen in-vitro was recorded. Results thus obtained analyzed and presented in Table 2 & Fig 2..

TABLE-2: Inhibitory effect of different chemical fungicides on the mycelium growth of *Pythium aphanidermatum in in-vitro* incubated at 27 ± 1°C

S. No.	Name of fungicides	Concentration (%)	Average colony diameter in (mm)	Inhibition percent
1.	Mancozeb (64%) + Metalaxyl (8%)	0.2	0	100
2.	Propiconazole	0.2	0	100
3.	Tebucanazole	0.2	0	100
4.	Difeneconazole	0.2	15.33	82.96
5.	Bayleton	0.2	20.00	77.77
6.	Mancozeb	0.2	20.33	77.41
7.	Capton (70%) + Hexaconazole(5%)	0.2	29.66	67.04
8.	Copper oxy chloride	0.2	35.00	61.11
9.	Anthracol	0.2	42.33	52.96
10.	Oxystrobin	0.2	77.66	13.71
11.	Carbendazim	0.2	80.33	10.74
12.	Thaiophanate Methyl	0.2	83.00	7.77
13.	Control		90.00	
	C.D. at 5%		3.069	

It is evident from the above Table 2 and Fig 2 that all fungicides showed these better responses in checking the mycelial growth of pathogen over control. Among these Mancozeb (64%) + Metalaxyl (8%), Propioconazole and Tubuconazole completely inhibited the growth up to hundred percent. Difeneconazole (15.33mm) was next in superior followed by Bayleton (20.00mm) which was statistically at par with Mancozeb(20.33mm). Rest fungicide Captain+Hexaconazole (29.66mm), Copper oxychloride (35mm), Antracol (42.33mm), Oxystrobin (77.66mm), Carbendazim (80.33mm) and Thaiophanete methial (83mm) were showed their response in decreasing order. However Carbendazim (80.33mm) and Thaiophanate Methyl (83mm) were at par and lest effective in minimizing the mycelia growth of pathogen.

CONCLUSION

On the basis of the inhibitory effect on the growth of the pathogen, twelve chemical fungicides were tested *in vitro* against *Pythium aphanidermatum*. Of those Mancozeb (64%) + Metalaxyl (8%), Propioconazole (2%) and Tubuconazole (2%) proved to be most effective, as completely inhibiting the growth of the pathogen. Similarly eight bio-agents were evaluated in laboratory condition, *Trichoderma koningii showed the best performance against the pathogen.*

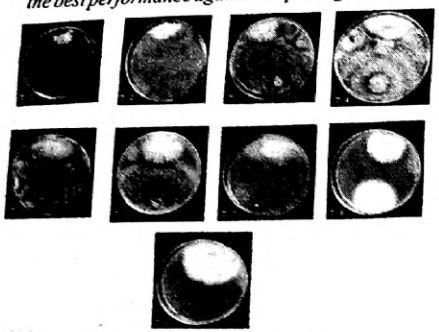

Fig 1:-Bioassay of bio-agents

[Trichoderma koningii (T_1), *Trichoderma harzianum* (T_2), *Trichoderma longibrachiatum* (T_3), *Pencillium notatum* (T_4), *Trichoderma viride* (T_5), *Trichoderma atroviride* (T_6), *Aspergillus niger* (T_7), *Chaetomium globosum* (T_8), Control(T_9)]

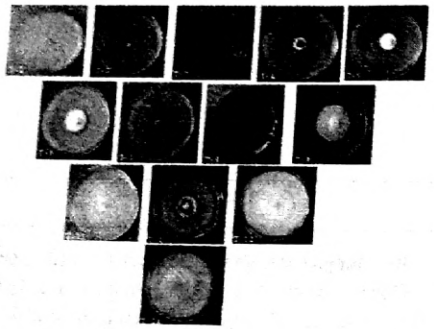

Fig 2:- Bioassay of chemical fungicides

[Mancozeb (64%) + Metalaxyl (8%) (T1), Propiconazole(T2), Tebucanazole(T3), Difeneconazole(T4), Bayleton (T5), Mancozeb(T6), Captain+Hexaconazole(T7), Copper oxy chloride (T8), Anthracol(T9), Oxystrobin(T10), Carbendazim(T11), Thaiophanate Methyl (T12) and Control(T13)]

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Journal of Natural Resource and Development 12 (1) 15-18, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

EFFECT OF STRATIFICATION DURATION AND HORMONE CONCENTRATION FOR SEED TREATMENT ON SEED GERMINATION, RATE OF SEED GERMINATION, TRANSPLANTING SUCCESS AND SEEDLING MORTALITY IN AONLA *(EMBLICA OFFICINALIS,* GAERTN.)

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Received : 30.03.2017 *Accepted : 25.04.2017*

ABSTRACT

The experiment was conducted at the Department of Horticulture, Kulbhasker Ashram Post Graduate Collage, Allahabad, Uttar Pradesh with a view to standardize suitable stratification duration and hormone concentration for Aonla seed treatment. There were seven treatment combinations (T_1 to T_{10}) including a control. Different duration of seed stratification i.e., 24hours,48 hours and 72hours were tried along with the 100ppm,200ppm and 300 ppm GA_3 seed treatment. Treated seeds were sown in the polythene bags (25x15 cm size, 200gauge thick) containing soil, sand and FYM mixture (1:1:1). It was interesting to note that the effect of stratification duration and hormone treatment concentration was found to be significant for seed germination, transplanting success, seedling mortality percentage and rate of seed germination. Treatment T_6(48hrs+300ppmGA3) yielded highest percentage, (84.00) of seed germination while the lowest percentage value (37.25) was recorded in T_9 (72hrs+300ppmGA3) treatment and the transplanting success was also lowest in T_9. The seedling mortality percentage was maximum (79.25) with T_9 where as lowest percentage value (22.00) was observed for T_6 treatment. It may be concluded that T_6 treatment can be recommended for the better stand establishment of Aonla nursery.

Key Words: Stratification, treatment, nursery, aonla, mortality, seedling, germination, seed.

INTRODUCTION

Increased demand of aonla *(Emblica officinalis,* Garten.) buddlings in traditional as well as nontraditional areas of India due to its peculiar character of diverse use, medicinal value ,tolerance to biotic and abiotic stresses ,higher benefit cost ratio and positive government policies emphasized to chalk out some feasible and acceptable measures for the better stand-establishment of saplings at the nursery stage. Aonla buddlings are prepared thorough budding on seedling root - stock which is obtained through seeds. In nature, aonla seed has poor germination and higher seedling mortality, owing to adverse edaphic conditions during nursery stage. Therefore it becomes imperative to standardize suitable stratification time and exact hormone concentration for seed treatment for flourishing the aonla nursery-industry. Certainly, these tactics are the most important component to provide sound base for propagation, once time and concentration is standardize, we shall be able to grow healthy seedlings with faster rate.

Keeping these aspects in view, the experiment was under taken to ascertain the effect of the stratification and hormone treatment on seed germination, rate of seed germination, transplanting

success and mortality of seedlings.

MATERIALS AND METHODS

The experiment was conducted at the Department of Horticulture, Kulbhasker Ashram Post Graduate Collage, Allahabad, Uttar Pradesh during the year 2012-13 with a view to standardize suitable stratification duration and hormone concentration for Aonla seed treatment. There were ten treatment combinations (T_1 to T_{10}) including a control. Different duration of seed stratification i.e., 24hours, 48 hours and 72hours were tried. Soaked seed were put in layers under different strata of moist sand for varying duration. GA_3 hormone @ 100ppm, 200ppm and 300 ppm was used for seed treatment after stratification. Treated seeds were sown in the polythene bags (25x15 cm size, 200gauge thick) containing soil, sand and FYM mixture (1:1:1).

Table: 1 Effect of stratification duration and hormone concentration on seed germination and rate of seed germination in Aonla *(Emhlica officinalis,* GAERTN.)

Treatments	Seed germination (%)								*Rate of seed germination*
	3 DAS	6 DAS	9 DAS	12 DAS	15 DAS	18 DAS	21 DAS	27 DAS	*Mean days taken in seed germination*
T_1 (24hrs+100ppmGA3)	2.95 (9.89)	22.66 (23.29)	. . .. .	48.33 (37.06)	53.66 (40.92)	56.00 (45.12)	56.00 (45.12)	56.00 (45.12)	10.43
T_2 (24hrs+200ppmGA3)	3.05 (10.3)	22.66 (25.29)	- - ..	50.33 (40.06)	58.66 (45.92)	60.00 (50.12)	60.00 (50.12)	60.00 (50.12)	10.25
T_3 (24hrs+300ppmGA3)	3.25 (10.30)	24.66 (28.29)	47.33 (40.4)	53.33 (45.06)	60.66 (48.92)	61.00 (52.12)	61.00 (52.12)	61.00 (52.12)	10.01
T_4 (48hrs+100ppmGA3)	2.36 (8.83)	25.66 (30.29)	49.33 (44.4)	55.33 (48.06)	63.66 (52.92)	64.00 (53.12)	64.00 (53.12)	64.00 (53.12)	11.40
T_5 (48hrs+200ppmGA3)	3.60 (10.82)	25.66 (30.33)	51.33 (45.76)	61.66 (51.75)	- . . .	65.00 (53.72)	65.00 (53.72)	65.00 (53.72)	11.24
(72hrs+300ppmGA3)	5.63 (13.55)	27.66 (31.64)	57.66 (49.41)	64.00 (51.13)	83.33 (68.91)	84.00 (69.35)	84.00 (69.35)	84.00 (69.35)	11.03
(72hrs+100ppmGA3)	2.63 (10.75)	24.53 (33.21)	39.85 (39.44)	42.25 (41.44)	44.25 (42.44)	44.25 (42.44)	45.49 (43.21)	45.49 (43.21)	9.24
(72hrs+2 00ppmGA3)	2.33 (6.75)	23.53 (30.21)	39.25 (38.44)	40.25 (39.44)	41.25 (40.44)	41.25 (40.44)	41.25 (40.44)	41.25 (42.44)	9.01
(72hrs+3 00ppmGA3)	2.23 (5.75)	22.53 (28.21)	37.25 (37.44)	37.25 (37.44)	37.25 (37.44)	37.25 (37.44)	37.25 (37.44)	37.25 (37.44)	8.25
(control)	2.53 (8.75)	20.53 (23.21)	33.25 (32.44)	43.12 (39.21)	48.00 (41.04)	49.54 (42.32)	50.74() (43.49)	50.74 (43.49)	15.52
C.D. at 5%	-	3.24	3.11	2.89	2.75	3.01	3.01	3.01	2.36

Note: figures in parentheses are average transformed value.

Table: 2 Effect of stratification duration and hormone concentration on seedling mortality and transplanting success in Aonla *(Emhlica officinalis,* GAERTN.)

Treatments	*Seedling mortality (%)*					*Transplanting success (%)*
	28 DAS	35 DAS	42 DAS	49 DAS	56 DAS	
T_1 (24hrs+100ppmGA3)	12.00 (22.30)	23.09 (32.04)	28.93 (34.91)	35.01 (38.03)	35.01 (38.03)	74.43
T_2 (24hrs+200ppmGA3)	11.00 (21.30)	21.09 (30.04)	26.93 (32.91)	30.91 (34.03)	30.01 (34.03)	75.25
T_3 (24hrs+300ppmGA3)	10.99 (21.10)	20.89 (29.94)	26.63 (32.81)	30.01 (33.93)	30.01 (33.93)	76.01
T_4 (48hrs+100ppmGA3)	8.99 (20.10)	19.99 (29.64)	25.66 (31.41)	29.00 (33.13)	29.00 (33.13)	79.40
T_5 (48hrs+200ppmGA3)	8.63 (19.55)	19.66 (28.64)	24.66 (30.41)	26.00 (32.13)	28.00 (32.13)	81.24
T_6 (48hrs+300ppmGA3)	7.63 (15.55)	17.66 (24.64)	20.66 (27.41)	22.00 (28.13)	22.00 (28.13)	91.03
T_7 (72hrs+100ppmGA3)	45.63 (39.75)	48.53 (40.21)	50.85 (43.44)	58.25 (52.44)	58.25 (52.44)	49.24
T_8 (72hrs+2 00ppmGA3)	58.33 (51.75)	62.53 (55.21)	65.25 (57.44)	68.25 (58.44)	68.25 (58.44)	39.01
T_9 (72hrs+3 00ppmGA3)	62.23 (55.75)	69.53 (58.21)	77.25 (62.44)	79.25 (65.44)	79.25 (65.44)	35.25
T_{10} (control)	46.63 (39.95)	49.53 (41.21)	51.85 (44.44)	59.25 (53.44)	59.25 (53.44)	65.52
C.D. at 5%	2 . 31	3.54	3.42	3.89	2.95	4.43

Note: figures in parentheses are average transformed value.

RESULTS AND DISCUSSION

Seed germination in aonla started after 3 days of seed sowing and completed within 27 days in all the treatment. Seed germination under different treatments ranged between 37.25 to 84.00 percent. The percentage of seed germination as influenced by treatments differed significantly The maximum seed germination (84.00 %) was recorded in treatment T_6 (48 hrs stratification+300 ppm GA_3) which was significantly superior to all other treatments and the value was lowest (37.25%) in T_9 (72 hrs stratification+300 ppm GA_3). The findings of the study supported and corroborated the findings of Bisla *et al., (1984)* in Ber and Govind and

Chandra, (1993) in Khasi Mandrin. The lowest percentage of seed germination obtained with treatment T9 indicated adverse effect of longer duration of stratification coupled with toxic concentration GA3 which augmented seed decay and partial damage of seed too. Over tendering of seed coat and ultra concentration of GA3 might be corroded the plume and radicle of the seed resulting failure of germination. The possibility of exo-osmosismay not be denied. Dewey, (1960); Paliwal & Gandhi (1968) and Ayers and Westcot (1976) also observed the same causes.

There was insignificant difference on the rate of aonla seed germination as it was conspicuously influenced by various duration of stratification and seed treatment. However, the faster rate of seed germination was recorded in T9 (72 hrs stratification+300 ppm GA3) i.e.8.25 mean days followed by T8 (72 hrs stratification+2ppm GA3) i.e.,9.01 mean days). The slowest rate of seed germination was recorded T10 (control) i.e., 15.52 mean days). Similar result were also recorded by Bahuguna and Pyarelal, (1993) in case of *Acacia*. There was a noticeable and significant effect of treaments on transplanting success. *All* those treatments respond poor in seed germination also were poor in transplanting success. Though seeds were sown in polythene bags and gently transplanted into the field.

The differences due to various treatments in respect of seedling mortality differed significantly The mortality of aonla seedling range between 22.00 to 79.25 per cent within 56 days of seed sowing.The highest mortality was recorded (79.25%) in T_9 (72 hrs stratification+300 ppm GA_3).followed by 68.25 per cent in T_8 (72 hrs stratification+200 ppm GA_3, and the value was lowest (22.00%) in T_6 (48 hrs stratification+300 ppm GA_3 $_{treatment}$. Similar results were also found by Awang and Hamzah (1986) in *Acacia*. Aonla seed soaking more than 48 houres was proved detrimental in terme of seed germination and mortality Therefore soaking hours should not constitute more than 48 hours to achieve better survival of aonla seedlings. Obviously, more leaching had toxic effect of hormone on tender seedlings and higher osmotic pressure, imbalanced nutrient level lead to mortality of the seedlings The findings are in the conformity of the findings of the Sharma *et al.*, (1984) and Gupta,(1989).

Based on the result obtained from investigation it can be concluded that seed soaking for 48 hours followed by 300 ppm seed treatment with GA_3 resulted best performance with regards to percent seed germination (84.00%) and least seedling mortality (22.00%).

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Journal of Natural Resource and Development 12 (1) 19-23, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

EFFECT OF VEGETATIVE PROPAGATION TECHNIQUES THROUGH BUDDING AND GRAFTING OF BAHERA (TERMINALIA BELLERICA)

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Received : 11.02.2017 *Accepted : 15.03.2017*

ABSTRACT

The study was conducted at National Research Centre for Agroforestry, Jhansi during 2005 and 2006. One year old rootstock with average collar diameter of 6.0 mm raised in polythene bags were taken and used for budding or grafting. Bud/ graft take observations after two week gave clear picture of bud or graft success. Observations indicated that during the year 2005 and 2006, cleft grafting showed maximum success in July and August months (65-75%). Initiation of bud/ graft sprout was observed, in 16-23 days while completion in both the years ranged between 27-38 days. Grafted plants produced more height than the plants raised through budded. The plants budded/ grafted in the month of July recorded better growth than those of in August.

Key words: Bahera, chip budding, cleft grafting, patch budding, veneer grafting

INTRODUCTION

Bahera (*Terminalia bellerica*) belonging to family Combretaceae is native of India. The fruits have multiple medicinal and industrial usages. Due to narrow canopy, the species has potential under agroforestry system. Sizeable variability with respect to fruit yield, fruit size and bearing habit has been reported (Anon, 1989). There is ample scope to select elite genotype and perpetuate it true to the type through vegetative propagation. Further the spp. exhibit long juvenile phase. Vegetative propagation techniques are known to reduce gestation period. Budding and grafting are important methods of vegetative propagation wherein plants are perpetuated on the roots of others. The special advantages of the method lie in exploitation of specific abilities of rootstock (stionic influence). The information available on vegetative propagation of Bahera is scanty. Therefore present study was planned.

MATERIALS AND METHODS

The experiment was consisted of two methods of budding i.e. patch budding and chip budding; and two methods of grafting i.e. cleft grafting and veneer grafting. The operation was performed in the month of July and August during the year of 2005 and 2006 replicated thrice in completely randomized design. Thus, 8 treatment combinations viz. patch budding in July, chip budding in July, cleft grafting in July, veneer grafting in July, patch budding in August, chip budding in August, cleft grafting in August and veneer grafting in August were employed on a year old root stock possessing average collar diameter 6.0 mm. the observations were recorded on bud/ graft take days taken to initiate and complete sprouting, per cent success of bud /graft, growth of

ultimate plant were recorded and subjected to statistical analysis as suggested by Panse and Sukhatme (1995).

RESULTS AND DISCUSSION

Bud/Graft take

The recorded data revealed that bud/ graft take after one week of the treatment ranged between 71 to 98% in both the years of experimentation (Table 1). The bud/ graft take decreased sharply after one week in both the years. After 3 weeks bud take remained almost static and most of the buds/ grafts started sprouting. After 2 weeks of budding/ grafting, bud/graft take showed significant variations due to method of budding/ grafting. However, effect of time of budding/ grafting was non-significant. Maximum (66.7-75%) bud/ graft take was recorded in cleft method of grafting in both the years while minimum (25%) for veneer grafting in July 2005. Hartman *et al* (1993) reported that union takes place within 2-3 week depending upon growing conditions.

Days taken to initiate and complete sprouting and bud/graft success

The observations recorded on days taken to initiate sprouting ranged between 16-23 days (Table 2). Days taken to complete sprouting did not show any significant variation in both the years. Sprouting was completed within 26 to 35 days in different treatments. Maximum (75%) success was obtained in cleft grafting in the month of August closely followed by that in July (65%). Minimum (25%) success was recorded in veneer grafting. The differences in graft success on account of method of quality were significant in both the years. While working on vegetative propagation of Bahera in Himachal Pradesh (temperate climate). Sharma and Thakur (2001) reported that side veneer grafting failed to sprout whereas chip budding gave marginal success in the month of June. In another report, Sharma *et al.* (1995) reported that *T.bellerica* and *T.chebula* as well can be propagated in situ by patch budding. Srivastava (2000) reported success of cleft grafting in *T.chebula* and advocated clonal propagation for high profitability.

Singh (1992) reported that age of stock and mother plant affects success of grafting. Thakur *et al.* (2004) while working on *T.chebula* reported that time of budding plays important role in success of chip budding in the species in April month as compared to July.

Plant Growth

Effect of time and method of budding/ grafting on growth of Bahera plant in terms of height, canopy spread, and number of leaves were recorded at quarterly interval upto one year of study. Data revealed that plant height was recorded higher in case of grafting than budding in either month (Table 3). However, difference in plant height between budded and grafted plants mitigated with ages of plant. The significant differences in plant height were observed between budded and grafted plants across the treatments after 12 months of the study. The greater plant height (48.5 cm) was recorded for chip budded plants in the month of August. These results are in accordance with the results reported by Kumar and Shukla (2008) in Custard apple.

The data recorded quarterly on canopy spread of budded/ grafted plants. In general, grafted plants exhibited higher canopy spread than budded plants (Table 4). This is obviously due to more number of leaves in grafted plants. At the end of experimentation, cleft grafted plants recorded significantly higher canopy spread in both the years. Similar results have been reported in mango by Nayak and Sen (2000B) who observed better growth of sprout consequent upon grafting than budding.

Similarly, observations on number of leaves per plant varied with season. In general, grafted plants recorded higher number of leaves than budded plants throughout the study period (Table 5). Significant variation in number of leaves during 2005 due to time and method of propagation throughout the study period may be attributed to prevailing weather conditions. In 2006, only method of grafting showed significant effect on number of leaves at termination of study. However, this needs to be revalidated. Our findings are in accordance with the findings of Kumar and Shukla (2008) in Custard apple and Tewari *et al.* (2002) in Aonla.

They also reported variation in growth of ultimate plant due to time of grafting. However, the difference in growth narrowed down with age due to rapid growth and uniform nutrient supply through established root system.

CONCLUSION

Thus it can be concluded that the cleft grafting in the month of July and August gave greater success in Bahera plantation under semi-arid conditions of Jhansi region.

ACKNOWLEDGEMENT

The authors are grateful to the Director, National Research Centre for Agroforestry, Jhansi for providing necessary facilities to conduct the experiment.

Table 1: Graft take % at weekly interval as influenced by time and methods of budding/ grafting

Treatments		Graft take (%) at weekly interval					
Time	Methods	After one weak		After two weak		After three weak	
		2005	2006	2005	2006	2005	2006
July	Patch	88.3	71.7	38.3	38.3	36.7	38.3
	Chip	86.7	86.7	28.3	33.3	28.3	33.3
	Cleft	78.3	86.7	71.7	66.7	71.7	66.7
	Veneer	73.3	90.0	26.7	53.3	25.0	30.0
August	Patch	81.7	88.3	43.3	38.3	43.3	38.3
	Chip	85.0	83.3	38.3	48.3	38.3	31.7
	Cleft	98.3	93.3	73.3	75.0	73.3	75.0
	Veneer	83.3	96.6	40.0	40.0	40.0	36.7
CD (P=0.05)							
Time		NS	NS	NS	NS	NS	NS
Method		NS	NS	13.7	17.7	13.7	17.6

Table 2: Days taken to initiate and complete sprout and graft success % as influenced by time and methods of budding/ grafting

Treatments							
Time	Methods	Days taken to initiate sprout		Days taken to complete sprout		Graft success %	
		2005	2006	2005	2006	2005	2006
July	Patch	17.7	17.3	35.3	29.0	36.7	35.0
	Chip	18.7	18.7	38.0	26.3	28.3	30.0
	Cleft	17.3	17.7	32.7	29.0	65.0	65.0
	Veneer	21.7	21.0	32.7	33.7	25.0	30.0
Aug	Patch	16.3	17.7	34.7	30.3	36.7	33.3
	Chip	18.7	19.3	32.0	32.7	31.7	31.7
	Cleft	16.0	16.7	31.3	35.0	70.0	75.0
	Veneer	23.0	21.7	30.7	30.3	30.0	26.7
CD (P=0.05)							
Time		NS	NS	NS	NS	NS	NS
Method		3.3	NS	NS	NS	10.2	14.8

Table 3: Plant height (cm) as influenced by time and methods of budding/ grafting

Treatments		Plant height at quarterly interval							
Time	Methods	3 month		6 month		9 month		12 month	
		2005	2006	2005	2006	2005	2006	2005	2006
July	Patch	20.5	21.6	23.1	23.1	36.1	34.6	46.4	45.8
	Chip	21.1	21.0	24.5	24.7	36.0	36.3	45.7	46.0
	Cleft	27.4	27.2	28.4	29.7	40.1	41.6	48.5	50.8
	Veneer	25.8	24.3	26.7	26.3	38.3	38.7	47.4	49.4
Aug	Patch	17.2	20.6	20.1	24.1	31.0	35.2	42.1	45.8
	Chip	17.1	21.0	20.1	24.7	32.0	35.0	41.0	45.4
	Cleft	20.3	20.4	23.1	24.3	34.2	35.0	44.2	46.0
	Veneer	20.8	20.2	24.5	24.7	35.0	35.6	45.4	46.1
CD (P=0.05)									
Time		1.4	1.4	1.3	1.4	1.2	1.0	1.5	1.2
Method		2.0	1.9	1.9	2.0	1.6	1.4	2.1	1.8

Table 4: Spread (cm) as influenced by time and methods of budding/ grafting

Treatments		Spread at quarterly interval							
Time	Methods	3 month		6 month		9 month		12 month	
		2005	2006	2005	2006	2005	2006	2005	2006
July	Patch	12.17	12.70	7.0	7.10	7.4	12.27	24.2	22.87
	Chip	10.73	12.37	8.6	7.13	9.2	12.37	20.7	22.37
	Cleft	15.97	19.30	9.3	12.87	9.5	17.97	25.9	28.27
	Veneer	18.47	16.10	12.2	10.40	13.4	14.30	28.7	24.27
Aug	Patch	13.43	12.70	7.1	7.97	7.6	12.70	22.6	21.83
	Chip	10.73	11.43	7.4	7.15	8.0	11.37	23.5	22.37
	Cleft	13.97	14.10	7.3	8.10	7.7	13.70	23.7	25.90
	Veneer	13.83	14.32	7.2	8.40	7.8	13.43	22.8	23.90
CD (P=0.05)									
Time		NS	1.2	1.1	1.1	1.2	NS	2.2	1.2
Method		2.2	1.4	1.6	1.6	1.7	2.4	1.6	1.7

Table 5: Number of leaves as influenced by time and methods of budding/ grafting

Treatments		Number of leaves at quarterly interval							
Time	Methods	3 month		6 month		9 month		12 month	
		2005	2006	2005	2006	2005	2006	2005	2006
July	Patch	5.8	8.1	1.9	3.8	8.4	7.3	11.4	12.8
	Chip	6.8	7.1	1.9	1.9	8.5	9.5	12.0	11.9
	Cleft	7.1	9.5	2.1	4.1	7.6	11.9	14.1	15.1
	Veneer	7.4	12.7	2.2	6.4	8.2	15.8	13.7	18.0
Aug	Patch	5.8	5.8	1.9	1.9	4.0	7.5	11.4	13.0
	Chip	6.8	7.1	2.2	2.0	6.5	8.5	12.0	11.9
	Cleft	9.1	7.5	5.9	2.6	9.6	8.4	16.1	14.5
	Veneer	12.4	7.7	8.7	2.6	12.0	10.8	18.7	15.3
CD (P=0.05)									
Time		1.2	2.1	0.3	0.9	1.3	1.8	1.2	NS
Method		1.6	NS	0.4	1.3	1.9	NS	1.7	2.3

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Journal of Natural Resource and Development 12 (1) 24-28, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

ROLE OF FRONT LINE DEMONSTRATION ON KHARIF SORGHUM- SUDAN FOR TECHNOLOGY DISSEMINATION IN FATEHPUR DISTRICT OF UTTAR PRADESH

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Received : 21.04.2017 *Accepted : 29.05.2017*

ABSTRACT

Quality nutritious roughage with low concentrate is economical for enhancing the production and quality of milk. Fodders specially the green roughages form the main stay of our worthy livestock to decrease the competition between human-beings and animals due to ever increasing demand for land and other inputs. Rice-wheat being the major cropping system, farmers of district Fatehpur usually feed weeds/grasses/crop residues in the name of fodder to their animals. Keeping in view the non-availability of nutritious green fodder during rainy season front line demonstration for fodders was planned and implemented accordingly. The present investigation was conducted to study the effect of feeding green fodder–sudan along with existing traditional feeding practices of dairy animals under Kharif F.L.D. programme conducted by C.S.A. Krishi Vigyan Kendra, Tharion, Fatehpur during the last nine years, i.e. 2005-06 to 2015-16. The study revealed that multicut sorghum-sudan (MFSH-4 / KS-85 / Ankur safed / GK-908 / SSG-5000 varieties) gave better forage yield, ranging from 370 q/ha to 610 q/ha against local check of 245 to 380 q/ha. The milk yield of dairy animals 05-10 days prior to feeding, 05-10 days and 30–35 days after starting feeding sudan was observed and recorded. The average increase in milk yield recorded was 31.42%, 31.42%, 34.13%, 30.55%, 30.0%, 28.20%, 30.77%, 30.77% and 34.48% during FLD period 2005-06, 2007-08, 2008-09, 2009-10, 2010-11, 2011-12, 2012-13, 2014-15 and 2015-16 respectively. A part to increase in milk yield the health condition of the milch animals was also observed better than those who were not fed sudan.

***Key words:**, Forages, fld, green fodder, KVK's, livestock, sorghum-sudan*

INTRODUCTION

Natural resources, environment and particularly agriculture is under intense pressure due to ever increasing demand for food grains. By 2050, global population is expected to reach nine billions and demand for food will grow by 70 per cent (Solomon, 2017). Livestock are integral part of farming system in India. The livestock sector is socially and economically very significant in the country due to the multi-functionality of livestock performing output, input, assets and socio cultural function (Yadav *et al.* 2017).

The forage resources in India are mainly derived from crop residues, cultivated forages and grazing from pasture and grass lands. The crop residues mainly constitute the major feed material in most of the states. India has around 4.9 per cent of the total cropped area under cultivated fodders and cattle of intensive cropped area obtain only 25 per cent of their feed from grazing in nearby forest and

other uncultivated lands, and the balance comes from crop residues unsuitable for human consumption. Fodders/forages form the main stay of our livestock to decrease the competition between human-beings and animals due to ever increasing demand for land and other inputs.

Krishi Vigyan Kendra's an innovative institution, also known as knowledge resource centre for farming community of the district plays an important role in the transfer of technology to the farmers. KVK Fatehpur functioning under the Umbrella of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur has been making its humble contribution through its various village oriented programmes and activities for improving agricultural production and providing self employment in agriculture and allied sectors. Livestock sector has been considered an important agrarian activity for rural livelihood and employment since centuries, it still plays a crucial role in shaping the rural economy and is a major continuous income generating activity for the rural mass.

Several dairy/livestock development programmes and improvement of dairy farming technologies have enhanced the milk production of India from 17.0 million tones in 1950-51 to 155.50 million tones in 2015-16 (DAH, D & F, GOI), placing India on top rank in milk production, contributing around 18.5 per cent of World Milk Production. The per capita milk availability per day has reached 337gms in 2015-16.

Uttar Pradesh, India's most populous state, with 68715147 livestock ranks Ist in livestock population and has around 1.3 million hectares area under forages (UPL). Fatehpur lies between the parallel of 35-26°. and 26-16°. north latitude and between 80-14°. and 81-20°. east longitude spreading about 104 km from west to east and 40 km from north to south in between two holy rivers Ganga and Yamuna flowing in north and south, respectively.

MATERIALS AND METHODS

The present study was conducted in adopted villages of CSA, Krishi Vigyan Kendra, Fatehpur district of Central U.P. which falls under Central Plain (Agro-climatic) Zone-V of the state. U.P., a part of relatively more advanced regions, being the highest milk producing as well as milk consuming state of our country. The less developed district Fatehpur comprising of thirteen development blocks falling under three talukas/tehsils namely Sadar, Bindki and Khaga. Out of the total thirteen blocks, nine development blocks namely – Airayan, Hathgaon, Hanswa, Malwa, Asother, Vijaipur, Bahua, Bhitaura and Teliyani were purposely selected for detailed investigation, collection and record of information as the first stage sampling unit, which were covered under FLD programme during the last 9 years i.e. 2005-06 to 2015-16.

Multistage stratified random sampling technique was adopted for selection of sample household, keeping in view the small and marginal farmers who were active in participating in the training programmes, field days, Kisan Gosthies, etc. organized by the KVK, were covered under FLD and provided quality (HY) seeds as critical input along with technical guidance for better yield of the fodder. The FLD farmers were insured to show sudan well in time i.e. 25 June to 20 July. The desired information from FLD farmers was collected in the purposely developed and pre-tested schedules and questionnaires through personal interview technique and observations already recorded by the concerned scientist personally during FLD visits yearly basis. Thus the data collected from beneficiaries of fifty two villages covering nine blocks were analyzed statistically and data interpreted.

RESULTS AND DISCUSSION

The data regarding type of feed and system of feeding revealed that jowar/maize, sudan chari + lobia, bajra, green grasses with bhusa along with grazing was practiced by majority of farmers during kharif (rainy season). Forages are coarse bulky feed with more than 18 per cent crude fibre and low in digestible nutrients (NFE around 40 per cent) such as crude protein and energy. The most important cheap nutrients source for cattle is roughage (green fodder) Milch animals require good quality green

roughages for expression of full genetic potential of milk production Sole feeding of green forages to dairy animals is much cheaper than feeding concentrate with crop residues and has the potential of higher level of milk production (Das and Mahanta, 2010). Good quality high nutritious roughage with low concentrate is essential and economical for increasing the production and quality of milk.

Table-1: Average fodder yield and increase in milk yield of milch animals under FLD

Year	No. of blocks	No. of villages	No. of farm-ers	Area (ha)	Av. demo. yield (qt./ ha)	Av. Milk yield 0-5 days before feeding	Av. Milk yield 30-35 days after feeding	Av. Increase in milk yield (%)	Av. rainfall in mm*	Other parameters /health condition
2005-06	3	07	10	1.0	475	2.00-4.00	3.25-5.50	31.42	502.7	+++
2007-08	4	06	8	1.0	537	2.75-3.75	4.00-6.00	31.42	518.50	+++
2008-09	4	08	10	1.0	610	2.50-4.25	4.00-6.25	34.13	1167.70	++++
2009-10	2	02	5	1.0	515	2.00-4.25	3.25-5.75	30.55	465.70	+++
2010-11	3	04	10	1.0	485	2.50-4.50	4.00-6.00	30.00	609.60	+++
2011-12	4	05	10	2.0	455	2.75-4.25	4.00-5.75	28.20	577.31	++
2012-13	5	06	10	2.0	415	2.50-4.25	4.0-5.75	30.77	582.00	+++
2014-15	4	6	20	2.5	370	2.50-4.25	4.00-5.75	30.77	255.73	+++
2015-16	4	8	20	2.5	385	3.00-4.25	4.00-5.75	34.48	128.32	++++
Total:	33	52	103	14	-	-	-	-	-	-

*Rainfall during crop season June – October

On the basis of the information collected from the beneficiaries/family members it was revealed that due to lack of quality pasture lands feed and feeding practices were almost similar among the livestock owner covered under FLD, with slight change in quality and amount of forages fed to dairy animals depending upon stage of lactation. More than 70 percent of farm holding are marginal in our country which makes these nonviable even for arable crops and therefore the farmers are reluctant to allocate land to grow fodder crops for the livestock.

The cost of feeding towards milk production may come upto 80 per cent when the milk production primarily depends upon concentrate based feeding, nearly 65 percent of the total expenditure of milk production in cows is attributed to the feeding of animals when both concentrates and green fodders are fed as mixed ration, while on forage based feeding it could be reduced to only 40 percent of the total expenditure (Das and Mehta, 2010). Lower genetic potential, inadequate supply of quality feed and fodder and lack of health care and management are important reasons for low productivity of the animals (Yadav, 2007). Further, milch animals specially require good quality nutritious forages, which has many additional benefits for expression of full genetic potential of milk production.

It is a well known fact that the importance of quality feed and fodders in attaining maximum genetic potential of Indian Cattle, including the indigenous breeds is well recognized and documented by several researchers. Garg (2012) reported that milk production in dairy animals can be improved through balanced feeding, there is a considerable scope for the enhancement of milk production with existing feed feeding management

and animal resources.

From the perusal of the data depicted in Table-1 it is evident that sudan feeding to dairy animals along with existing feeding practices had enhanced the average milk yield of animals from 28.20 – 34.48 per cent in different years. The demonstrations of sudan variety – MFSH-4 / Sudan Chari and SSV-84, conducted by zone-iv during 2010-11 under FLD reported 675, 588, 551 q/ha yield, respectively with an increase of 25.32 – 45.0 percent under farmer's field are contrary to preset findings may be ascribed to difference in variety/climate and location of the area. The demonstration conducted by KVK Mirzapur during 2013-14 reported average yield of 312.64 qtl/ha against local check of 278.45 qtl./ha with an increase of 12.28 per cent over local check. FLD conducted by seven KVKs of zone-iv during 2013-14 on sorghum CSH-22/PC-9 in 19.23 ha. of 118 farmer's field reported an average yield of 381.96 quintal against local check of 281.44 qtl./ha with an increase of 35.72 per cent in fodder yield.

Similarly, 25 demonstrations conducted by KVKs of zone-iv during 2014-15 reported an average yield of only 316.4 q/ha which is in consonance to present investigation. Likewise FLD conducted on sorghum in 2 ha. on 10 farmer's field gave an yield of 663 qtl./ha against local check of 531 qtl./ha with increase of 24.86 qtl./ha whereas, sudan in 3 ha on 30 farmer's field gave average yield of 242 qtl./ha against local check of 201 qtl./ha with ncrease of only 20.40 per cent in green fodder roduction, the results of present finding are artially contrary due to variety/situation of field id climate etc.

Likewise KVK of zone-iv also conducted D on nutrifeed (multicut sudan) in 1.0 ha on 15 ner's field reported average yield of 480 qtl./ha inst local check of 335 qtl./ha with increase of 8 per cent. The results of the present stigation have also proven that feeding of ed green sudan along with dry fodder bhusa / supplemented with traditional feeding system ome made concentrate mixture gave 28.20 t (2011-12) to 34.48 per cent (2015-16) increase in milk yield of milch animals under FLD farmers after 30-35 days of starting feeding green.

Adlib green feeding was not practiced, but majority of the respondents fed green legumes as well as non-legumes along with other available fodders. Findings of Panwar (1992) and Rathore (2009) who reported 34.25 percent farmers cultivated and fed green fodder to their buffaloes round the year, are contrary to the finding of present study and in consonance to Swaroop *et al.* (2014) and Swaroop *et al.* (2016).

CONCLUSION

On the basis of findings of the present investigation, it may be concluded that Rice–wheat being the predominant cropping system in the area, none of the farmers fed single green fodder. Traditional system of livestock rearing with grazing on fallow/harvested fields along with sani with locally available roughage and concentrate/ wheat flour prior to milking was the most common feeding practice. Respondents after FLD period were aware of scientific livestock feeding and realized that milch animals should be fed adequate quantity of green fodder to obtain their potential yield Thus there is a tremendous scope of green fodder cultivation round the year and scientific feeding management with available feed and green leguminous fodder for optimum and economical production.

ACKNOWLEDGEMENT

The authors sincerely acknowledge the financial assistance of *ICAR-ATARI* – zone-iv Kanpur and are very thankful to the family members of the respondents who rendered help in providing the necessary information for this investigation.

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Journal of Natural Resource and Development 12 (1) 29-34, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

EFFECT OF FOLIAR APPLICATION OF CULTAR AND NAA ON MARIGOLD (TAGETES ERECTA L.)CV BASANTI LOCAL

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Received : 31.03.2017 *Accepted : 01.05.2017*

ABSTRACT

Both plant growth regulators had great influence on vegetative and reproductive attributes of marigold. The effect of Cultar was more pronounced to NAA in reducing growth. All treatments were not better over control. NAA impacts more on vegetative attributes to that of Cultar. Flower generation was greater with NAA to cultar. Interaction effects were found in between to single application. Plant height was maximum (67. 36 cm) in N_3 and minimum (39.49cm) in C_3 while, the maximum branches per plant (18.51) were observed in $C_2N_3$and least (11.02) in C_3. Similarly, minimum and maximum values for leaves/plant (111.01&182.32), roots / plant (11.25&17.14) and tap root length (19.25 cm & 26.22cm) were recorded in C_3 & C_2N_3 respectively. From date to transplanting time taken for blooming was minimum in (59.45) C_3 and maximum (84.45) in N_3. Bloom -flower/plant 17.23 in C_3 & 31.42 in C_2N_3), non-bloom flower /plant (4.05 in C_2N_3 & 10.63 in C_3), flower diameter (4.01 in control & 6.96 in C_2N_3), flower size (23.22 cm2 in control & 29.56 cm2 C_2N_3), bloom-flower fresh weight (8.06 g in control & 10.73 g in C_2N_3) and bloom-flower dry weight (2.95g in control &3.51g in C_2N_3) were also minimum and maximum values for the parameters, respectively.

Key words: *Marigold, IBA, NAA, growth, flowering.*

INTRODUCTION

Growth retardants have played major role to suppress the vigor of the plant. Cultar like retardants have ability to modify vigor and orientation of the plant significantly. Genetic potential of plant have never been exploited completely so for. The reason behind this seems that plant phenotype is largely governed by physical environment. Modifications of environmental factors for better yield and quality of economic part of plant have remained a thirst area for researches. Among the tools, agro-chemicals have gained prime position especially for horticultural crop improvement. Marigold plant is well amicable to chemical application. It is grown as an ornamental crop for loose flowers, as a landscape plant, and as a source of pigment for poultry feed. Both leaves and flowers are equally important from the medicinal point of view. Leaf paste is used externally against boils and carbuncles. Marigold is adaptable to different types of soil conditions and thus can be grown successfully in a wide variety of soils. However, a deep, fertile, friable and well drained, soil pH 6.5 to 7.5 having good water holding capacity is the most desirable. Control of flowering is one of the most important practical aspects in application of plant growth regulators especially NAA and cultar hormones to regulate the flowering in ornamental plants Cathey (1964).

Auxin is well known to stimulate the flowering of plants. However, it has been found in various studies that flowering percentage was varied. Two treatments viz., cultar and NAA were tried for performance. NAA was more responsive to increase vigor than cultar. Two chemicals that is cultar and naphthalene acetic acid (NAA) were found more effective than the naturally grown plant. Today, NAA is still the most widely used auxin for flowering and yield augumentation Murti *et al.*, (2001). It has been repeatedly confirmed that auxin is required for initiation of flowers and adventitious roots on stems. The application of some plant growth retardants, together with auxin, has been used to improve the rooting capacity of cuttings in some species as well as flowering of plant. Plant growth regulators have gained wide acceptance for optimizing the yield of plants by modifying growth, development and stress behavior (Shukla and Farooqi, 1990). Synthetic plant growth regulators, such as auxins, cultar and various other growth retardants when applied exogenously to the plant, influence various aspects of plant development and biosynthesis of its important components (Shukla & Farooqi, 1990; Kewalanand & Pandy, 1998). Marigold requires a mild climate for luxuriant growth and flowering. Marigold seedlings are easily transplanted and established in field without much mortality. At the time of transplanting, they should ɔe stocky and bear three to four true leaves. Nitrogen s responsible to protein synthesis in the plant. ïrowth is more dependent to protein availability in lant. Cultar suppress the vegetative growth and served food make available to the plant. Its foliar plication dose not causes any injury when applied ɔroper concentration.

In the present study, the plants of Marigold 'e treated with plant growth regulators (NAA & ar). The aim of this study was to test the potential ct of plant growth regulators on the Marigold ts and to select their optimum concentration.

MATERIALS AND METHODS

In this study a local popular cultivar *Basanti* of Marigold was used .Two chemicals viz., an Alpha-naphtalene acetic acid (NAA), and (Paclobutrazol) were used for plant growth and yield regulation. Three concentrations of each viz., cultar @ 15ppm, 25ppm and 35ppm and NAA @ 200ppm, 300ppm and 400ppm were used as treatments of each plant separately and in combination, both. Cultar and NAA were applied thrice viz., at 20, 30 and 60 days after transplanting as foliar spray singly. In combination, 5 days interval was given between two chemicals applications. Sixteen treatment combinations were formed .These treatments were compared with the control which did not receive any chemical. The experiment was conducted in Randomized Block Design (RBD) under factorial experiment with three replications. The recommended agronomic practices were applied equally to all the plants in the field. Vegetative parameters viz., plant height, branches/plant, leaves/plant, roots/plant, tap root length, fresh plant biomass and bloom commence time were recorded. Plant height was taken from collar region to the longest branch of canopy. Branches/plant and leaves/plant were counted at flower bud formation. Roots/plant and tap root length was measured after bloom harvest .Fresh plant biomass was taken at full bloom stage. Reproductive traits viz., bloom -flower/plant, non-bloom flower /plant, flower diameter, flower size, bloom- flower fresh weight and Bloom-flower dry weight were recorded. Bloom -flower/plant were considered as those flowers which were able to open from flower buds. Non-bloom flower /plant were those which did not open and remain as flower bud. Flower diameter was recorded at full bloom stage. Flower size was calculated as a multiplication of flower length and width. Bloom- flower fresh weight was recorded at full bloom stage. Bloom-flower dry weight was measured after drying at constant weight. Data were statistically analyzed and conclusions were drawn.

RESULTS AND DISCUSSION

Influence of different concentration of cultar and NAA on vegetative attributes of Marigold:

Plant height, branches/plant, leaves/plant, roots/plant, tap root length, fresh plant biomass and bloom commence time were significantly influenced by cultar treatment. All the parameters were lower over NAA. Higher concentrations were

Table 1. Effect of plant growth regulators on vegetative characteristics of marigold plant.

Treatments	Plant height (cm)	Branches /plant (No)	Leaves/plant (No)	Roots/plant (No.)	Tap root length (cm)	Fresh Plant biomass (g)	Bloom commence (Days) (g)
Control C_0	51.33	13.66	120.66	13.66	21.32	515.77	71.63
Cultar15ppm C_1	49.45	14.55	140.36	14.03	22.03	482.65	69.79
Cultar25ppm C_2	45.55	12.04	120.45	12.55	20.55	442.96	65.55
Cultar35ppm C_3	39.49	11.02	111.01	11.25	19.25	384.23	59.45
SEM±	1.02	0.78	2.32	0.79	1.12	4.55	1.84
CD at 5%	2.23	1.54	4.56	1.90	2.56	8.45	3.23
Control N_0	51.26	13.10	130.25	13.19	21.23	512.01	71.56
NAA 200ppm N_1	51.25	15.33	148.64	14.00	22.00	515.41	71.23
NAA 300ppm N_2	56.23	16.21	165.32	16.44	24.32	568.50	76.02
NAA 400ppm N_3	67.36	17.98	169.33	16.63	25.22	660.45	84.45
SEM±	1.01	0.75	2.04	0.78	1.11	4.54	1.74
CD at 5%	2.12	1.45	4.25	1.87	2.45	8.36	3.01
Control C_0	39.22	13.28	130.99	13.85	21.01	356.09	56.02
Cultar +NAA $C_1 N_1$	50.11	14.66	142.23	14.56	22.31	495.01	65.55
Cultar +NAA $C_1 N_2$	52.23	15.45	152.25	15.63	23.42	525.23	79.33
Cultar +NAA $C_1 N_3$	54.33	16.94	163.42	16.61	24.36	530.23	74.03
Cultar +NAA $C_2 N_1$	47.74	12.01	121.41	12.78	20.45	464.02	65.62
Cultar +NAA $C_2 N_2$	48.96	13.12	132.41	13.44	21.55	482.00	67.44
Cultar +NAA $C_2 N_3$	49.55	18.51	182.32	17.14	26.22	689.00	69.45
Cultar +NAA $C_3 N_1$	47.45	13.55	132.11	13.21	21.42	472.33	67.23
Cultar +NAA $C_3 N_2$	49.66	14.65	142.74	14.37	22.23	492.46	69.44
Cultar +NAA $C_3 N_3$	43.88	15.74	152.77	15.11	23.44	432.75	63.52
SEM±	1.01	0.84	3.24	0.89	1.02	4.46	1.23
CD at 5%	2.25	1.58	7.25	1.71	2.51	8.35	2.01

detrimental to lower ones. Dissimilar pattern was observed in NAA treatment. NAA had better results to that of cultar treatment. Interaction effects of cultar and NAA were non-synergistic and yielded variable values for vegetative characters. Plant height was maximum (67.36 cm) in N_3 and minimum (39.49cm) in C_3 while, the maximum branches per plant (18.51) were observed in $C_2N_3$and least (11.02) in C_3. Similarly, minimum and maximum values for leaves/plant (111.01&182.32), roots / plant (11.25 &16.14) and tap root length (19.25 cm & 26.22cm) were recorded in C_3 & C_2N_3

Table 2. Effect of plant growth regulators on reproductive characteristics of marigold plant.

Treatments	Bloom - flower/plant (No)	Non-bloom flower /plant (No)	Flower dia. (cm)	Flower size (cm^2)20	Bloom-flower fresh weight(g)	Bloom-flower Dry weight(g)
Control C_0	21.20	7.02	4.01	23.22	8.04	3.00
Cultar15ppm C_1	23.02	8.01	5.20	25.01	8.08	3.0 1
Cultar25ppm C_2	19.55	9.36	5.45	26.20	9.06	3.12
Cultar35ppm C_3	17.23	10.63	5.63	27.42	9.07	3.22
SEM±	0.78	0.08	0.12	0.89	0.08	0.05
CD at 5%	1.74	1.01	0.95	1.24	1.02	0.75
Control N_0	21.33	7.85	5.00	23.25	8.05	2.99
NAA 200ppm N_1	25.05	8.01	5.96	26.56	8.07	3.02
NAA 300ppm N_2	27.62	7.00	6.23	27.36	9.08	3.24
NAA 400ppm N_3	29.23	6.02	6.33	28.35	9.09	3.26
SEM±	0.77	0.08	0.13	0.89	0.08	0.06
CD at 5%	1.75	1.01	0.99	1.23	1.03	0.07
Control C_0	21.74	7.00	5.00	23.25	8.05	2.95
Cultar +NAA $C_1 N_1$	23.45	8.00	5.99	26.99	8.08	3.01
Cultar +NAA $C_1 N_2$	25.56	7.00	7.22	28.45	9.09	3.27
Cultar +NAA $C_1 N_3$	27.22	6.02	7.42	28.66	10.05	3.29
Cultar +NAA $C_2 N_1$	19.20	10.23	6.02	28.75	10.02	3.30
Cultar +NAA $C_2 N_2$	21.45	7.01	6.36	27.45	10.05	3.08
Cultar +NAA $C_2 N_3$	31.42	4.05	6.96	29.56	10.73	3.51
Cultar +NAA $C_3 N_1$	22.04	7.22	6.45	28.36	10.04	3.02
Cultar +NAA $C_3 N_2$	23.02	6.22	6.44	28.44	10.06	3.03
Cultar +NAA $C_3 N_3$	25.88	6.23	6.01	28.43	10.01	3.04
SEM±	0.75	0.08	0.08	0.88	0.90	0.06
CD at 5%	1.54	1.02	1.03	1.76	1.03	0.75

especively. From date to transplanting time taken or blooming was minimum in (59.45) C_3 and aximum (84.45) in N_3. Findings are in conformity ith the findings of Saffari *et al.*, (2004) and Mesen 993). Inhibition in shooting with increased concentration of cultar was recorded by Paul *et al.* (1995), and Ozel *et al.* (2006). Maximum leaf size & leaves per plant were recorded in similar treatments by Sach *et al.*, (1975), Sach & Hackett (1972)

Influence of different concentration of cultar and NAA on reproductive attributes of Marigold:

Reproductive traits viz., bloom - flower/plant, non-bloom flower /plant, flower diameter, flower size, bloom- flower fresh weight and bloom-flower dry weight were studied. All the parameters were significantly influenced by cultar treatment in singly as well as in combination with NAA. Similarly, NAA alone as well as in combination had great influence for reproductive traits. Interaction effects were far better to that of single application. Bloom -flower/plant 17.23 in C_3 & 31.42 in C_2N_3), non-bloom flower /plant (4.05in C_2N_3& 10.63 in C_3), flower diameter (4.01cm in control& 6.96 cm in C_2N_3), flower size (23.22 cm2 in control & 29.56 cm2 C_2N_3), bloom-flower fresh weight (8.06g in control & 10.73g in C_2N_3) and bloom-flower dry weight (2.95g in control & 3.51g in C_2N_3) were also minimum and maximum values for the parameters,

Similar observations were recorded by Farooqi *et al.* (1993) as they reported the same result for Kinetin application on Damask rose in India. Waseem *et al.* (2007) found that the lowest concentration of NAA when used alone, showed its superiority over all the other concentration of NAA by producing the maximum number of shoots per explants, leaves and nodes per shoot. Ali et al. (2005) also reported in Chrysanthemum that an increase of NAA in MS medium resulted in decreasing the multiplication rate.Observations were at par with the observations of Singh and Shrivastava,(2009), Singh (2005),Singh and Singh (2003), Tjia *et al.*,(1977).

CONCLUSION

As per treatment growers may be used IBA and NAA together for greater yield and premium quality of marigold flower production. While applying the PGR, variety and season to be taken into consideration.

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Journal of Natural Resource and Development 12 (1) 35-37, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

EFFECT OF DIETARY SUPPLEMENTATION OF CALCIUM AND PHOSPHORUS ON COMPOSITIONAL QUALITY OF RAW MILK IN GANGATIRI COWS

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Received : 11.03.2017

Accepted : 26.05.2017

ABSTRACT

The present study was conducted to determine the effect of dietary supplementation of Calcium and Phosphorus on yield and compositional quality of raw milk in Gangatari cows at SHUATS dairy farm Allahabad with treatments as T_0 (control), T_1, T_2 and T_3 (feeding by mixing in concentrate 62.5 gram calcium carbonate, 25.0 gram sodaphos and 62.5 gram calcium carbonate + 25.0 gram sodaphos, respectively). Collected milk samples were subject to chemical analysis to determine the compositional quality of milk. The various parameters studied were Fat%, Solid not fat% (SNF), Protein% and Lactose% in milk. Statistical analysis of data of different milk constituents had shown non significant differences in milk fat%, milk SNF%, milk Protein% but had significant differences in milk lactose%.

***Keywords**: Calcium, phosphorus, fat, protein, lactose and SNF*

INTRODUCTION

Milk Production in India is growing at 4.2% per year and at present it contributes to around 15% of the total global milk output. The per capita per day availability of milk in India has increased from 132 g (1951) to 290 g (2013) which is comparable with average of world's per capita availability of 289 g milk per day (Patel, 2013). This achievement in milk production sector could be attributed to increase in the population of high yielding dairy animals. However, the demand in India by 2015 and 2020 is 140 and 170 million tonnes, respectively. With the efforts of farmers, technical expert, scientist and visionaries, milk production in India had reached to a commendable level of 134 million tons in 2013 (Bhasin, 2014).

Calcium and Phosphorus have more known functions in the animal body than other minerals. Cattle need calcium for skeletal growth and milk production. A deficiency can lead to "milk fever" around the time of calving, particularly in high milk producing milch breeds. A greater incidence of calving difficulty, retained placenta and prolapsed uterus may also occur. Calcium interacts directly with phosphorus. If dietary calcium levels are extremely high, phosphorus availability is reduced. Conversely, high levels of phosphorus impair calcium metabolism. In addition other complex macro and micro mineral interactions occur. High levels of phosphorus reduce calcium absorption while high levels of calcium reduce the absorption of iron, magnesium, manganese, phosphorus, zinc and iodine.

There is a great deal of variation in the composition of milk, even with the same animal is not always the same. Among the constituents the fat

content of milk is most variable. The other constituents vary in order are protein, lactose and ash. Factors responsible for such variations in the milk composition of in Gangatiri cows include stage of lactation individually (animal to animal),length of interval between milking, first and last milk, types of food physical conditions of the animal environment, disturbance time, exercise and most importantly the nutritional status of the animal. Keeping in view of above factors the present investigation was carried out to determine the effect of calcium and phosphorus on milk yield in Gangatiri cows along with the effect of these two on fat, protein, lactose and SNF in milk of Gangatiri cows.

MATERIALS AND METHODS

From the herd consisting of Gangatiri cows at SHUATS dairy farm, Allahabad, twelve healthy cows free from mastitis as detected by Californian Mastitis Test (Schalm and Noorlander, 1957) and other noticeable udder infection or injuries were randomly selected and divided into 4 treatment groups viz.T_0 (concentrate + wheat bhusa)), T_1(concentrate + wheat bhusa+62.5 grams calcium carbonate),T_2 (concentrate + wheat bhusa+25 grams sodaphos)and T_3 (concentrate + wheat bhusa+62.5 grams calcium carbonate+25 grams sodaphos) each one having 3 animals for this experiment. All selected cows were housed in tail to tail barn prepared for milking and dry full hand method of milking was followed. Collected milk samples for control and different treatments were subject to chemical analysis to determine the Fat%, Solid not fat% (SNF), Protein% and Lactose% in milk. First two streams of milk from all quarters were discarded as a measure of recommended routine practice (Singh and Prasad, 1987). Representative samples of 200 ml raw milk were collected in sterile conical flasks of 250 ml capacity and plugged aseptically with cotton plugs. These samples were brought immediately to the laboratory for chemical analysis of different milk constituents. The experiment was started after a adoption period of 9 days. The experimental ration was offered for 12 days to animals of each group. Parameters such as milk yield, fat, protein, lactose and SNF percent of milk were analyzed on weekly basis. The data on various parameters were collected, tabulated and subject to analysis of variance (ANOVA) as per Snedecar and Cocharan(1994).

RESULTS AND DISCUSSION

The highest mean fat % (Table-1) was recorded in milk of cows T_1 (4.78%) followed by T_0 (4.69%) T_2 (4.63%) and T_3 (4.60%).The differences in these were found non significant. The highest mean protein % (Table-1) was recorded in milk of cows T_1 and T_2 (3.39%) followed by T_0 (3.38%) and T_3 (3.35%).The differences in these were found non significant. Results of fat and protein percent of the present study are in agreement with the reports that concentration of P in the range of 0.32 to 0.57% of diet DM did not alter protein or fat percentage of milk Call et al. (1987), Kincaid et al.(1981), and Morse et al. (1994).

Table-1 Mean values of different milk constituents

S. No.	Parameter	Mean value of parameter				S/NS
1.	Fat%	$4.60^a T_2$	$4.63^a T_3$	$4.69^a T_0$	$4.78^a T_1$	NS
2.	Protein%	$3.35^a T_3$	$3.38^a T_0$	$3.39^a T_1$	$3.39^a T_2$	NS
3.	Lactose%	$4.07^a T_0$	$4.07^a T_2$	$4.08^a T_1$	$4.11^b T_3$	S
4.	SNF%	$7.49^a T_0$	$7.52^a T_3$	$7.53^a T_2$	$7.53^a T_1$	NS

*A similar alphabet on values within the parameters indicates non-significant difference

The highest mean lactose % was recorded in milk of cows in T_3(4.11%) followed by T_1 (4.08%) T_2 (4.07%) and T_0 (4.07%).The milk of cows in T_3 registered very small but significant effect of calcium and phosphorus concentration on lactose percentage. No reason for this small effect was apparent. The difference in lactose% of milk in cows under T_2, T_1 and T_0 were not significantly different. The highest mean solid not fat % was recorded in milk of cows in T_1(7.53%) followed by T_2 (7.53%), T_3(7.52%) and T_0 (7.49%).The differences in these were non-significant. These observations are consistent with previous reports by Wu et al (2003) and Wang et al (2014), which indicate that varying dietary P from 0.37 to 0.57% does not affect milk composition.

CONCLUSION

The result of present study conclude that calcium and phosphorus in ruminants are found to be beneficial .Though by supplementation of diet with calcium carbonate, sodaphos and combination of both the compound there was not any significant differences found in milk constituents such as fat%, SNF% and protein% in Gangatiri cows. However slight change in lactose percentage in milk was found when diet is supplemented with combination of calcium carbonate and sodaphos.

ACKNOWLEDGEMENT

The present work is duly acknowledged to the Vice Chancellor of SHUATS for providing necessary help in conducting the research work.

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Journal of Natural Resource and Development 12 (1) 38-42, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

ASCERTAINING THE INTENSITY OF SCLEROTINIA STEM ROT OF SUNFLOWER IN DIFFERENT LOCATIONS IN U.-P. UNDER NATURAL CONDITIONS

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Received : 31.01.2017

Accepted : 15.03.2017

ABSTRACT

Intensity of sclerotinia stem rot of sunflower in different locations in Uttar Pradesh was found significant variation. It was minimum (12 per cent) in Kanpur pocket and minimum (minimum) in Hardoi pocket. Pathogen city was found to dependent on type of inoculums used and it was found to vary from44 to 92 percent. Highest pathogenicity was inoculation with mycelium injured condition. The Shape and Sclerotia on all the media was Lenticular. The colour of sclerotia was dark brown to black in almost all the media tested except on few where it varied from light brown to grayish light black. Sclerotia were formed in concentric ridges on PDA, Czapeck,s(Dox) agar, Oat meal agar, Corn meal agar and Suburaud,s Agar media whereas they was edged on Brown,s starch agar,Haustan,s agar, Asthana and Hawker,s agar and standard nutrient agar media and scattered on Richard,s agar medium

Keywards: Inoculation, sclerotinia, fungus, sunflower, pathogen.

INTRODUCTION

Sunflower (Helianthus annuus L.) is an important oilseed crop in India. It contains vitamin A,D and K as well as good flavour substances and high proportion of polyunsaturated fatty acids which exhibit hypocholestoerolenic effect and are good in preventing heart disease. This oilseed crop is mainly cultivated to the states of Karnataka, Maharashtra, Tamilnadu, Andhra Pradesh, Uttar Pradesh, West Bengal and Orissa in our country. A critical review of the causes for low yield indicates that diseases are the major limiting factors in the successful cultivation of this crop. Sunflower is suffers from several fungal, bacterial, viral and nemetodal diseases from the time of sowing to harvesting as well as in storage. Amongest sclerotinia stem rot of sunflower(Morris and swingle, 1921) caused by sclerotinia sclerotiorum (lib.) de bary is found to be prevalent on important cultivars of this crop in moderate to heavy form causing substantial yield loss especially during kharif season.

Therefore, Keeping in view the seriousness of the disease and importance of the crop it is thought to conduct the experiment on survey of disease incidence at different location of U.P, test of pathogenicity through different types of inoculum, in-vitro. Study of growth and sclerotia production on different solid media and comparison of cultural characters of sclerotium on different solid media.

MATERIALS AND METHODS

(A) survey for ascertaining the incidence of disease

survey for ascertaining the intensity of sclerotinia stem rot of sunflower was conducted at regular intervals during rabi crop season 2001- 2002 at different locations in U.P. under natural conditions. The disease sample collected from different isolation for further studies.

(B) Pathogenicity Test

For testing the pathogenicity of the fungus susceptible plants of sunflower (modern) were inoculated artificially. The seeds of sunflower were

surface sterilized with 0.1% of mercuric chloride solution and were sown in pots filled with autoclaved soil. These pots were irrigated with water as and when required. The pots were inoculated by different methods / sources given below.

a-Disc method- mycelial disc of .5 mm diameter was cut from the margin of three day old cultures grown on PDA medium and placed at the base of one most healthy sunflower plants with the mycelium positioned against the stem. The inoculated plants were covered with polythene bags for one weak and irrigated throughout the experiment.

b-Fifty sclerotia of uniform diameter from one month old culture of S. Sclerotiorum. Were mixed upper 2 cm sterilized mixture of sand and seeds of sunflower were sown in each pot and were allowed to grow under natural conditions. High humidity was maintain at least 5 days by covering the pots with polythene bags. The moisture was maintained through out the experimentr.

a- Ascospore suspension- Ascospores were collected from mature apothecia on the lids of petridishes (Milinger,1969). The suspension of ascospores was prepare is distilled water(5 x 104 spores/ ml) containing 2% sugar. The suspension was sprayed on two month old plants of sunflower. The experiment was conducted in earthen pots of 30 cm diameter. Inoculated plants were covered with polythene bags to maintain high humidity for four days.

Infection and occurrence of disease symptoms were noted after 15 days of inoculation.

Determination of fungal growth in culture-

Ten different natural,synthetic and non synthetic media(PDA, Brown" starch sugar, Czapeck, corn meal agar, oat meal agar, Richards agar, Sabourand,s agar, Haustan agar, Asthana and Hawker,s agar and standard nutrient agar were used to study the cultural characters of the test fungus.

The prepared and sterilized, media were used for radial growth study. 20 ml sterilized semi liquid media was poured into sterilized petriplates of 9 cm diameter. These petriplates were inoculated with 5 mm disc and incubated at 20+_ 10c for seven days. The linear growth of the fungus was recorded. Morphological and cultural characters such as nature of growth, shape size and colour of the colony, growth, septation, width and branching of the mycelium, changes in substrate colour. To determination of the colour, The ridway,s used the size shape, colour and production of sclerotia were studied and data were recorded.

RESULTS AND DISCUSSION

The results in Table-1 reveal that the disease incidence varied from 9.5 to 28.20% in different agro climate conditions. The highest incidence of the disease was recorded at oilseed Research Farm Kalyanpur, Kanpur whereas it was lowest in the farmer's field at Hardoi. In rest of the fields, Disease incidence varied from 12 to 26.40 percent.

Table-1: Incidence of Sclerotinia stem rot of sunflower at different location in Uttar Pradesh

S. No.	Location	Av. per cent of disease incidence
1.	Oilseed Research Farm Kalyanpur, Kanpur	28.20
2.	Farmer's field, Baksitalab, Lucknow	26.40
3.	Farmer's field, Chaubepur, Kanpur	23.00
4.	Farmer's field, Shivrajpur, Kanpur	19.50
5.	Farmer's field, Bakewar, Etawah	16.10
6.	Farmer's field, Mainpuri	14.60
7.	Farmer's field, Muradganj, Auraiya	12.00
8.	Farmer's field, Herbal, Hardoi	9.50

Table-2: Pathogenicity of fungus exhibited through different types of inoculation

S. No.	Treatments	No. of plants subjected to infection	No. of plants showing diseases symptoms	Percentage of infection
1.	**Inoculation with disc of fungus**			
	i. Injured	25	22	88
	ii Un injured	25	11	44
2.	**Inoculation with the mycelial suspension**			
	i. Injured	25	23	92
	ii Un injured	25	15	60
3.	**Inoculation with sclerotia**			
	I Injured	25	19	76
	ii Un injured	25	11	44

A close perusal of the data presented in Table-2 and fig.5 revealed that inoculation of the plants with spore suspension proved to be the best method of inoculation as percent infection was maximum (92%) whereas inoculation with sclerotia was poor among all the methods tried. However, comparatively injured plant parts exhibited maximum infection among all the methods of inoculation.

Reisolation from the lesions developed artificially inoculated plants fielded the same fungus i.e. *Sclerotinia sclerotiorum* , which was previously isolated from the naturally infected sunflower plants. Isolation, inoculation and re isolation of the same fungus proved the Koch,s Postulation. The Result of growth of the pathogen on different culture media are presented in Table-3 and its corresponding histogram (fig.15) showed the maximum growth of the fungus on the PDA followed by Brown,s agar medium . The growth on PDA agar was significant and superior to Brown,s agar medium.

Table-3: Average diameter of the fungal colony and sclerotial development of *Sclerotinia sclerotiorum* on different solid media at 20 ± 1°C.

S. No.	Medium	Av. diameter of colony after 7 days (in mm)	Degree of sclerotial formation
1.	Potato dextrose agar	86.00	++++
2.	Brown's agar	81.00	++++
3.	Czapek's (Dox) agar	79.00	+++
4.	Corn meal agar	75.10	+++
5.	Oat meal agar	73.00	+++
6.	Richard's agar	69.20	+++
7.	Sabouraud's agar	65.30	+++
8.	Hauston agar	62.00	+++
9.	Asthana and Hawker's agar	58.30	++
10.	Standard nutrient agar	48.00	+
	CD at 5 % level	2.24	

Where,

++++ = Excellent

+++ = Good

++ = Fair

\+ = Poor

Good growth was also observed on czapek's (Dox) agar media were at par. The good growth in order of merit was recorded on corn meal agar, oat meal agar, Richards's agar, Sabouraded agar and Hauston'agar medium. However, Corn Meal was at par with oatmeal but other were significantly different from each other. Fair linear growth was recorded on Asthana and Hawker's medium whereas it was poor on standard nutrient medium. Similarly maximum sclerotia production was observed on PDA. Next bar medium for sclerotial production was Browns agar medium followed by Czapek's agar medium. Statistically, Corn meal Agar and oat meal Agar were at par to each other. The least production of sclerotia was observed on standard nutrient agar medium. In General Sclerotial Production was more or less according to the status of linear growth various other cultural characters exhibited by the fungus on different solid media were recorded by visual observation and results are summarized in Table-4. Colony characters were quite distinct on compact and uniform on PDA, Brown's starch agar and Czapek,s (Dox) agar medium good to uniform Haustan,s agar, Sabouraded agar,Asthana and Hawker,s agar,Whereas, it was poor on standard nutrient agar medium.average sparse on Haustan,s agar, Sabouraded agar, Asthana and Nutrient agar medium. The colony shape was circular on all the media. Aerial mycelia were abundant on PDA medium, moderate on Richard,s agar, Asthana and Hawker,s agar, Haustan,s agar and Standard nutrient agar medium. Scanty on Brown starch agar, Corn meal agar media.

The Shape and Sclerotia on all the media was Lenticular. The colour of sclerotia was dark brown to black in almost all the media tested except on few where it varied from light brown to grayish light black. Sclerotia were formed in concentric ridges on PDA, Czapeck,s(Dox) agar, Oat meal agar, Corn meal agar and Suburaud,s Agar media whereas they was edged on Brown,s starch agar,Haustan,s agar, Asthana and Hawker,s agar and standard nutrient agar media and scattered on Richard,s agar medium

Table 4-Effact of medium onsclerotinia mycelium.

Medium	Growth	Colony Characters			Sclerotia characters		Pattern of formation
		Shape	Colour	Aerial Mycelium	Shape	Colour	
Potato dextrose agar medium	Excellent, compact uniform	Circular	White	Abundant	Lenticular	Dark black	Concentric ring
Brown' s starch agar	Excellent, compact uniform	Circular	White	Scanty	Lenticular	Dark black	Concentric ring
Czapek's (Dox)	Good, compact, uniform	Circular	White	Abundant	Lenticular	Dark black	Concentric ring
Corn meal agar	Average, compact	Circular	White	Scanty	Lenticular	Greyish	Concentric ring
Oat meal agar	Good, Uniform	Circular	White	Scanty	Lenticular	Light black	Concentric ring
Richard's agar	Average, compact	Circular	White	Moderate	Lenticular	Black	Concentric ring
Sabouraud's agar	Average, sparse	Circular	White	Scanty	Lenticular	Black	Concentric ring
Hauston agar	Average, sparse	Circular	White	Moderate	Lenticular	Black	Edged
Hauston agar	Average, sparse	Circular	White	Moderate	Lenticular	Black	Edged
Standard nutrient	Poor, compact	Circular	White	Moderate	Lenticular	Light Black	Edged

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Journal of Natural Resource and Development 12 (1) 43-46 , 2017 | NASS RATING : 3.46 | ISSN-0974-5033

EFFECT OF PROBIOTIC ON CLINICAL DIARRHOEA OF HUMAN HEALTH

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Received : 13.03.2017

Accepted : 15.04.2017

ABSTRACT

The study was conducted unequivocal evidence that administration of probiotics could be effective in the treatment of acute infectious diarrhoea in children and the prevention of antibiotic associated diarrhoea and acquired diarrhoea. The evidence is also emerging for the effectiveness of probiotics in the prevention and management of pouchitis and paediatric atopic diseases, and the prevention of postoperative infections. There is also strong evidence that certain probiotic strains are able to enhance immune function, especially in subjects with less than adequate immune function such as the elderly. The efficacy of probiotics in the prevention of traveller's diarrhoea, sepsis associated with the management of ulcerative colitis, and lowering of blood cholesterol remains unproven. In addition to firm evidence of efficacy major gaps exist in our knowledge regarding the mechanisms by which probiotics modulate various physiological functions and the optimum dose, frequency, and duration of treatment for different probiotic strains.

Key words: Probiotic, diarrrhoea, disease, human health

INTRODUCTION

Probiotic bacteria are live microorganisms belonging to the natural flora with low or no pathogenicity, but with functions of importance to the health and well being of the host. Maintenance of this ecological flora is important in preventing disease, especially infections. It is increasingly accepted that probiotic bacteria are effective tools for controlling overgrowth of PPMs of bacterial, viral, and fungal origin (O'Sullivan *et al* 1992). Probiotic bacteria can control various enteric pathogens such as *Salmonella typhimurium* (Perdigon *et al* 1990), *Shigella* (Nakaya *et al* 1984), *Clostridium difficile* (Cortheir *et al* 1985), *Campylobacter jejuni* (Antoine *et al* 1989) and *Escherichia coli* (Juven *et al* 1991). They may also provide important protection against urogenital pathogens such as *Gardnerella vaginalis*, *Bacteroides bivius*, *Candida albicans*, and *Chlamydia trachomatis* (Klebnoff *et al* 1991). Much evidence thus supports the expectation that probiotic bacteria can be effective weapons for preventing and treating many microbial infections. By 1877 Pasteur and Joubert had already observed the antagonistic interaction between some bacterial strains, and by the turn of the century Metchnikoff had discussed the possibility of bacterial replacement therapy (Metchnikoff *et al* 1907). As recently pointed out by Jack ever since these observations there has been a small group of scientists who have stubbornly promoted bacteriotherapy and MIT as methods for preventing infections and some other diseases (Jack *et al* 1995). During the past 50 years, however, interest has been focused on the use of chemotherapeutics and antibiotics for these purposes: a clinical field of study which, during almost half a century, developed with enormous speed.

There are several reasons for the renewed and more general interest in infection control through MIT, including the following:

(1) The recognition that antibiotic therapy has not been successful to the extent one might have expected. Although it has no doubt solved some medical problems, it has also created some new ones.

(2) An increasing awareness of the fact that antibiotic treatment deranges the protective flora, and thereby predisposes to later infections.

(3) An increasing fear of antibiotic resistant microbial strains, as a result of widespread overprescription and misuse of antibiotics.

(4) A fear that industry will no longer be able to develop effective antibiotics at a sufficient rate to compete with the development of microbial resistance to old antibiotics.

(5) A widespread public interest in ecological methods.

Despite dramatic advances in intensive care technology and in the development of new antibiotics, the mortality associated with Gram negative bacteraemia has continued to remain between 20% and 40% (Wells *et al* 1992) and the leading causes so far have been *E coli*, *Klebsiella pneumoniae*, other Enterobacteria, and *Pseudomonas aeruginosa*. Thus the mortality reported today is about the same as that during the preantibiotic era despite (Felty *et al* 1924), more than 50 years of treatment development. There is very little hope that further treatment developments among the existing paradigms of treatment will dramatically change this situation (Burd *et al* 1992). There is a great need for new treatments. The condition and function of the gastrointestinal (GI) tract are essential to our well being. After the respiratory tract, the GI tract constitutes the second largest body surface area, described to be somewhere between 250 and 400 m^2, or comparable in size to a tennis court. During a normal lifetime 60 tons of food pass through this canal, which is important for well being, but also constitutes an enormous threat to the integrity of the digestive tract of the whole body. It is not surprising, therefore, this organ is often affected by inflammatory diseases and cancer. The continuous challenges to the surfaces might be why most of the surface cells have a rapid turnover; most are replaced after four days in man and sometimes earlier in the gut. Furthermore, the surface is protected by secretions of important secretions, from saliva in the oral cavity to colonic secretion in the large intestine. These secretions contain factors of great importance for the lubrication of the mucosa and for functions of the GI tract but also hundreds of ingredients of importance for intraluminal microbial defence. The secretory functions are extremely sensitive to foreign chemicals. About 50% of the 2000 pharmaceutical drugs registered in Sweden have reported GI side effects, for example, mouth dryness, nausea, vomiting, diarrhoea, and obstipation. It is hoped that future medicine will be more restrictive in the use of pharmaceuticals in general, and will use drugs with as few side effects as possible. At present, physicians often choose the most effective drug without regard to side effects. A wise alternative could be to choose a somewhat less effective drug, if it has fewer or no side effects.

Prevention And Treatment Of Diarrhoeal Disease

A number of clinical trials have tested the efficacy of probiotics in the prevention of acute diarrhoeal conditions.[7] Diarrhoea is the most frequent side effect of both the short and long term use of antibiotics, particularly during multiple antibiotic regimens. Coadministration of probiotics to patients on antibiotic therapy has been shown to reduce the incidence of antibiotic associated diarrhoea in children and in adults. In placebo controlled studies, diarrhoea occurred at a rate of 15% to 26% in the placebo arms but only in 3% to 7% of patients receiving a probiotic. Different strains have been tested including *Lactobacillus rhamnosus* strain GG, *Lactobacillus acidophilus, Lactobacillus bulgaricus*, and the yeast *Saccharomyces boulardii*. Two meta-analyses concluded that probiotics could be used to prevent antibiotic associated diarrhea (Cremonini *et al* 2002).

Nosocomial diarrhoea is a major problem in paediatric hospitals worldwide. Prophylactic use of probiotics has proven useful for the prevention of acute diarrhoea in infants admitted into the hospital ward for a chronic disease condition. In a double blind, placebo controlled trial, Saavedra and coworkers showed that supplementation of an infant formula with *Bifidobacterium bifidum* and *Streptococcus thermophilus* reduced the incidence of diarrhoea (7% *v* 31%) and rotavirus shedding (10% *v* 39%) in hospitalised infants aged 5–24 months (Saavedra *et al* 1994). In another placebo controlled double blind study, oral administration of *L rhamnosus* strain GG to infants (1–36 months old), hospitalised for reasons other than diarrhoea, reduced the risk of nosocomial diarrhoea (6.7% *v* 33.3%) and rotavirus gastroenteritis (2.2% *v* 16.7%) (Szajewska *et al* 2001). Prevalence of rotavirus infection was not influenced by probiotic treatment but the risk of symptomatic rotavirus enteritis was significantly reduced. A third published clinical trial on nosocomial diarrhoea in infants (1–18 months old) showed no statistically significant benefit of *Lactobacillus GG* intake (Mastretta *et al* 2002), but the rate of symptomatic rotavirus enteritis in the probiotic arm (13.2%) was found to be lower than in the placebo arm (20.8%).

Probiotics may also be useful in the prevention of community acquired diarrhoea. The study by Oberhelman and coworkers included 204 infants (6–24 months old) from an indigent periurban town who were followed up over a 15 month period (Oberhelman *et al* 1999). Significantly fewer episodes of diarrhoea per child per year were observed in children given *Lactobacillus GG* supplemented gelatin than in the placebo (control) group. In a multicentre, randomised, double blind trial conducted over four months with 928 healthy children aged 6–24 months (Pedone *et al* 2000). The incidence of acute diarrhoea was significantly reduced by supplementation with *Lactobacillus casei* fermented milk (15.9%) as compared with yogurt (22%). Several studies have investigated the efficacy of probiotics in the prevention of travellers' diarrhoea in adults, but methodological deficiencies, such as low compliance with the treatment and problems with the follow up, limit the validity of their conclusions (Marteau *et al* 2002).

The benefit of probiotics as a treatment for acute diarrhoea in children has also been demonstrated. **Probiotics such as *Lactobacillus reuteri*, *Lactobacillus GG*, *L casei*, and *S boulardii* have proven useful in reducing the duration of acute diarrhoea in controlled clinical trials.**

Treatment of *Helicobacter Pylori* Infection

Probiotics have been tested as a new strategy for eradication of *Helicobacter pylori* infection of the gastric mucosa in humans. Some strains of lactic acid bacteria are known to inhibit the growth of *H pylori* in vitro. However, administration of a probiotic-containing yogurt was found to be ineffective in the eradication of *H pylori* infection in 27 subjects (Wendakoon *et al* 2002). Two studies that examined the use of probiotics as a supplement to the classical triple therapy with antibiotics also failed to demonstrate any beneficial effect of probiotic therapy. In contrast, in a non-blinded trial, the triple therapy plus yogurt resulted in a higher *H pylori* eradication rate than the triple therapy only (91% *v* 78%) by intention-to-treat analysis. It is important to note, however, that *H pylori* eradication rates were similar for both groups of patients (93.5% *v* 89%, not significant) by per protocol analysis—that is, when considering only the patients that completed the seven day antibiotic therapy. Interestingly, a lower number of dropout events were observed in the yogurt group. Since the trial was not blind, the consistency of this observation needs to be confirmed.

RESULTS AND DISCUSSION

Several mechanisms (producing antimicrobial substances, stimulating mucus secretion, strengthening gut barrier function, competing for adhesion sites, stimulating specific and non-specific immune responses, etc) by which probiotics mediate their anti-infection effects have been suggested (Gills *et al* 2003). However, the relative importance of these mechanisms remains unknown.

It is concluded that the administration of probiotics could be effective in the treatment of acute infectious diarrhoea in children and the prevention of antibiotic associated diarrhoea and acquired diarrhoea. **The evidence is also emerging for the effectiveness of probiotics in the prevention and management of pouchitis and paediatric atopic diseases, and the prevention of postoperative infections. There is also strong evidence that certain probiotic strains are able to enhance immune function, especially in subjects with less than adequate immune function such as the elderly. The efficacy of probiotics in the prevention of traveller's diarrhoea, sepsis associated with the management of ulcerative colitis, and lowering of blood cholesterol**

remains unproven.

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Journal of Natural Resource and Development 12 (1) 47-50, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

PHYTO-SOCIOLOGICAL BEHAVIOUR OF WEED COMMUNITIES IN AGRICULTURAL SYSTEMS

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Received : 19.04.2017

Accepted : 25.05.2017

ABSTRACT

Weeds are recognized worldwide as an important type of undesirable economic pest especially in agricultural practices. Weeds may have a general role in supporting biodiversity within agro ecosystem. Weed density is one of the most important factors affecting weed competition with crops and will justify some part of crop yield loss in competition with weeds. Keeping in view the above, the present work on "Phyto-Sociological Behaviour of Weed Communities in Agricultural Systems" was carried out in the light of some defined phytosociological parameters. Phyto-sociological surveyes are useful as tools to shed light on the dynamics of weed species and their interactions in arabale fields. Survey of the weed botanicals inhabiting study area (Lucknow Zone) was performed in order to get the vegetation pattern of ecological community incropland ecosystems. Data obtained from the various obervations of the sampling sites reveals clearly that bermuda grass is dominating over other grassland species followed by spanish flag, then country mallow and white top weed, and so on.

Keywords : *Weed, physico-sociological, agricultural system.*

INTRODUCTION

A weed is aplant which has or has potential to have, a deterimental affect on economic, social, or conservation value (National Weeds Strategy, 1997).Weeds are naturally strong competitors and those weeds that can best compete always tend to dominate. Weed community is revealed by biodiversity at several scales and perspectives. Weed biodiversity implicates community dynamics. Weed biodiversity is the pool of potential candidate population that might invade, seize and exploit local agricultural opportunity (Verma & Pandey, 2014 a & b). The basis of community is the behavior and the life history of an individual plant. Individuals form local population in communities. Holzner & Immonen (1982) and Marshall et. al. (2003) indicate that human action is the most important factor determining the occurrence and distribution of agricultural weed species. Haas & Streibig (1982) also note that other weeds have increased in both prominence and abundance as agricultural practices change.

Phyto-sociological servey in simple terms, is a group of ecological evaluation methods whose aim is to provide a comprehensive overview of both the composition and distribution of plant species in a given plant community.The aim of phyto-sociological studies for weed science is similar to that of ecological studies. To understand the applicability of phyto-sociological serveys for weed science, their ecological basis need to be understood and the most suitable ones have to be chosen, because it is considered that arable fields have a relatively distinct group of selecting factors when

compared to natural plant communities.

MATERIALS AND METHODS

To characterize the vegetation under the project area, present study was carried out by using standard Quadrat method and Random sampling approach.After data are collected in the field, they need to be translated into easily understandable tables and graphs. Importance components are associated with plant traits which turn a given species into a weed inside the community. Importance value is a reasonable measure to assess the overall significance of a species since it takes into account several properties of the species in the vegetation. Several synecological parameters may be considered for the importance of each species in the system (Pandeya et. al. 1968, Barbour et. al. 1998), namely: abundance, density, cover, frequency, homogeneity, dominance, sociability, vitality, periodicity, constance, and fidelity.

Three of these parameters are suggested as the most significant ones for describing weeds dynamics in arable fields: density, frequency, and dominance. Density is the number of plants rooted within each quadrats. The avarage density per quadrat of each species can be extrapolated to any convenient unit area.Frequency is the proportion of total quadrats which contains atleast one rooted individual of a given species.A dominant species of a community is the over-story species which contributes the most cover or basal area (in case of large trees) to the community, compared to other over-story species.

Based on these three parameters (density, frequency, dominance), the imoportance value of each species in the community can be easily estimated. Importance value index will be calculated as per Curtis & McIntosh (1950).

Importance Value Index = (Relative Density + Relative Frequency + Relative Dominance)

IVI = (RD + RF + RM)

RESULTS AND DISCUSSION

In nature various kinds of organisms grows in association with each other. A localized association of several population of different species (plant/animal) living in a given geographical area or habitat is known as community. In each community there are diverse species. Floristic composition is determined by periodic collection and identification of plant species found in the whole community by using quadrat methods. These studies should be conducted in every season in order to have a complete data.Large parts of the world are currently dominated by human modified ecosystems that often comprise a greater biomass of introduced than native organisms (Vitousek et. al. 1997). There are thousands of alien species known to establish around the world and many more introduced species remain undetected or unrecognized (Ruiz et. al. 2000). So, plant invasions are clearly a potent force of change, operating on a global scale and affecting many dimensions of society (Ohlemuller et. al. 2006).

In order to get the dominance and ecological success of weed botanicals observed (during three major seasonsunder the present course of investigation) in the studied cropland ecosystem of the experimental zone, different quantitative parameters have been assessed. Through quadrats these parameters viz., dispersion, numerical strength, and coverage were estimated and illustrated in the Table 1.The quadrat was laid down on ten different places and the frequency, density, and dominance of plant species repeatedly appeared in study area were recorded and tabulated systematically. Frequency and density were found to be maximum in case of *Cynodon dactylon*(Figure 1) in comparison to rest of the observed plant samples. The dominance reached to its utmost value for *Lantana camara* due to its perennial, and shrubby nature of habit.

From Table 1, the IVI for observed plant samples was calculated after summing up the values of relative frequency, relative density, and relative dominance. IVI result clearly indicates that *Cynodon* species is the main dominating flora of investigated cropland ecosytem followed by Lantanas and Mallows. On the other hand *Coccinia* species demonstrated its least dominance and scattered distribution. After getting the values of IVI for each weed botanicals studied during present

course of work, these values were further applied as a tool to develop the phytograph for diagrammatic representation of most potentweed specimen (Cyanodon) illustrated in Figure 1.

Table 1: Dominance and Ecological Success of Weed Botanicals Studied in the Cropland Ecosystem

Name of Botanicals Studied (Weeds)	Frequency	Relative Frequency (RF)	Density	Relative Density (RD)	BasalArea	RelativeDominance (RM)	IVI
Lantana camara L.	8	10.53	2.2	9.17	0.849	16.34	36.04
Parthenium hysterophorus L.	9	11.84	2.4	10.00	0.607	11.68	33.52
Ageratum conyzoides L.	8	10.53	2.1	8.75	0.527	10.14	29.42
Tridax procumbens L.	7	9.21	1.6	6.67	0.477	9.18	25.06
Xanthium strumarium L.	6	7.89	1.4	5.83	0.664	12.78	26.6
Coccinia grandis (L.) Voigt	5	6.58	1.2	5.00	0.453	8.72	20.3
Croton sparsiflorus Morong	8	10.53	3.2	13.33	0.321	6.18	30.04
Euphorbia hirta L.	7	9.21	2.5	10.42	0.301	5.79	25.42
Sida cordifolia L.	8	10.53	1.8	7.50	0.816	15.70	33.73
Cynodon dactylon (L.) Pers.	10	13.16	5.6	23.33	0.1808	3.48	39.97

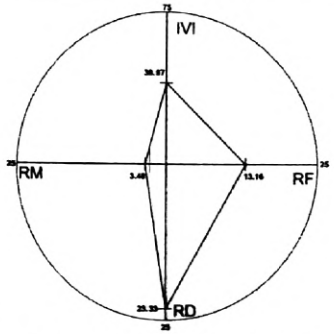

Figure 1- Phytograph of *Cynodon dactylon* (L.) Pers.

CONCLUSION

Based on the three phytosociological parameters (density, frequency, dominance) studied, the importance value of each species in the weed community of studied area can be easily estimated. The most important weed species will be those with a higher number of individuals (density), widely distributed in the area (frequency), and capable of suppressing the other species as a result of faster growth and mass accumulation (dominance). Experimental findings implicate that *Cynodon* is the most noxious amongst studied weed botanicals in agricultural systems.

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Journal of Natural Resource and Development 12 (1) 51-54, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

OCCURRENCE OF UNUSUAL EVENTS: FRUIT ABNORMALITIES IN GUAVA AND PAPAYA

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Received : 21.04.2017 *Accepted : 25.05.2017*

ABSTRACT

Fruit abnormalities occur in all kinds of plants and are very interesting. These abnormalities can be induced through genetic factors as mutations occurring naturally during the cell division or induced externally through environmental factors. This study has been done to evidence two rare events related to fruit abnormalities in guava and papaya and leaf abnormality in papaya. In guava fruits showed the presence of leaves inside them. Whereas, in papaya plants showed an abnormal development of fruits in the male plants, these fruits were not like the normal fruits. They were oblong to pear shaped with reduced size and various other abnormal features and the same plant also showed leaves with entire margins as opposed to the normal dissected leaves that are a regular feature of papaya plants. Both the above mentioned cases are very unusual and rare. In papaya plants the observations indicated the hermaphrodite characteristics that bear bisexual flowers and are capable of producing fruits like the female papaya plants. The gene might be present in the papaya plant which got activated and formed a few simple leaves. In case of guava, we can relate the abnormality to vivipary that led to the formation of leaves inside the fruits.

Keywords: *Fruit abnormalities, vivipary, hermaphrodite*

INTRODUCTION

Fruit abnormalities are very common phenomenon in the plants of all kinds of fruits and are interesting because they can suggest various aspects about the fruit morphology which are difficult to ascertain. Certain fruits have been observed to be irregular in their form, structure or colour. Occurrence of double fruits, woody fruits or various other distortions has been described by Hodgson (1935); Schroeder (1942).

The reason for such aberrations is still unknown (Schroeder 1953-54). The work reported here has been done in connection with the studies that have been carried out in Department of Botany, A.M.U., Aligarh to evidence in the present studies two rare events related to fruit abnormalities in guava and papaya and leaf abnormality in papaya. The first case was reported in guava where the fruits showed the presence of leaves inside them. Another case was observed in papaya plants which showed an abnormal development of fruits in the male plants and the same plant also showed leaves that had entire margins as opposed to the normal dissected leaves that are a regular feature of papaya plants [Fig: f]. Both the abovementioned cases are very unusual and rare, that have not been reported so far by any other researcher. In the first case, the guava fruits bought from the market when cut into two halves were found entirely filled with small, thick fleshy leaves. It was further noticed that the seeds after germination directly developed into leaves.

Each seed after germination bear a single leaf. These leaves were dark green in colour with distinct midrib and blunt tip. Whereas, the normal leaves had acuminate tips. [Fig: a, c, d]

In papaya plants the abnormality in fruits and leaves were recorded. In this study we observed the occurrence of fruits in male papaya plants, the fruits were elongated, highly reduced in size as compared to those borne on female plants and showed various distortions in their form and structure as shown in [Fig:e].This observation indicated the presence of hermaphrodite characteristics in papaya plants that bear bisexual flowers and are capable of producing fruits like the female papaya plants. In this plant we also noticed that some leaves were not dissected and were entire in outline without any toothing or serrations and possessed simple and smooth margins.

Fruit abnormalities can be induced through genetic factors as mutations occurring naturally during the cell division or induced externally through environmental factors as wind, water, insects or stress (Hofshi and Arpaia 2002). Use of plant growth hormones is becoming a popular trend nowadays for increasing yield and enhancing the product quality. However, their addition can lead to various abnormalities and defects in fruits (Garcia *et al.* CG 0901).

De Mason and Tisserat (1980) have shown that a higher concentration of 2,4-D in the medium can induce bisexuality in the male flowers resulting in the growth of pistillodes into fruit like structures which are devoid of ovules. This can also be a reason behind such malformations. In case of guava, we can relate the abnormality to vivipary. It is the growth of plantlets inside the flower and it can be defined as the continuous growth of the offspring while it is still attached to the mother parent (Goebel 1905). Vivipary is of common occurrence in Mangroves. Vivipary or the precocious seed germination was also observed in papaya fruits while they were still attached to their parent plant in the variety Madhubindu (Saha 2007).

Thus the occurrence of leaves inside the fruits can be a case of vivipary that occurred in the guava fruits and led to the formation of leaves inside the fruits. It can also be attributed to the environmental factors or the physiological metabolism of the plant such as the reduction in the abscisic acid content which can lead to viviparous germination as was observed in mangroves (Farnsworth *et al.* 1998). Usually the papaya plants are dioecious with separate male and female plants and are different from each other as far as their flowers are concerned. The male flower is small sized, numerous, with a long and common stalk. The female flower is large sized as compared to the male flower, with not more than 7 flowers borne on the common stalk and when it opens it already contains the baby papaya. In a survey, we observed fruits in the male papaya plants. These plants were identical to a normal male papaya plant were recorded to bear fruits like the female papaya plants. These fruits were not like the normal fruits . They were oblong to pear shaped with reduced size and various other abnormal features. These findings are in agreement with prior investigations done on papaya plants reported by Tariq (2011). According to his report, there exists some hermaphrodite papaya plants that bear bisexual flowers containing about 1-10 fruits, which were smaller than the fruits present on the female plants. Their colour was similar to the female fruits and was found sweeter than the fruits present on the female plants.

Some of the leaves in this plant were entire with smooth margins and showed no dissection or toothing as observed in the normal papaya leaves. Leaf shape is the typical characteristic feature of each plant. The information regarding the shape of the leaves is stored in the DNA. According to researchers, there is a gene called RCO (reduced complexity) which is active in the growing leaves and is responsible for dissected leaves. It ensures the prevention of cell growth and cell proliferation in the areas of leaf margins between the sites of leaflet formation. It is due to this reason that the leaves in *Arabidopsis* are simple and entire as their growth is not inhibited by this gene. This gene was lost by *Arabidopsis thaliana* over the course of time and evolution and it resulted in the formation of simple leaves (Vlad *et al.* 2014).

Thus we can say that this gene might be present in the papaya plant which got activated and formed a few simple leave

Figures showing fruit abnormalities in Guava and Papaya

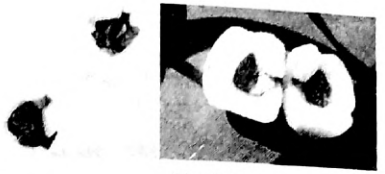

Fig. (a) Fig. (b)

Fig. (c) Fig. (d)

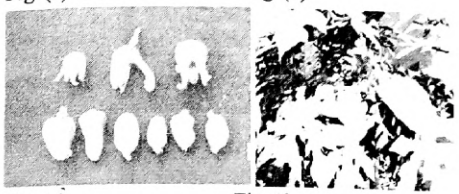

Fig. (e) Fig. (f)

Fig:a guava fruits filled with leaves

Fig:b guavas with dark brown vacant centre and rudimentary seeds

Fig:c leaves found inside guava fruits

Fig:d showing guava fruits and leaves that were present inside them

Fig:e male papaya fruits with various deformities

Fig:f shows the development of entire and smooth margins in papaya leaves.

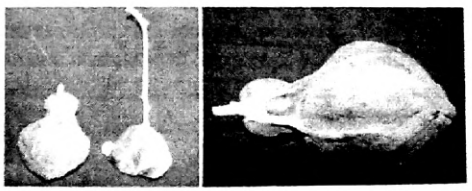

Fig. (g) **Fig. (h)**

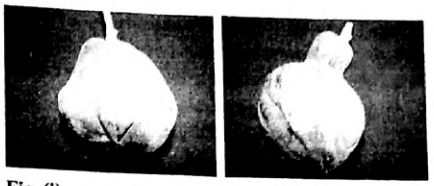

Fig. (i) **Fig. (j)**

Fig. (k) **Fig. (l)**

Fig:g,h,i,j shows the male papaya fruits with deformities.

Fig:k,l, shows papaya leaves with abnormal margins without serrations.

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Journal of Natural Resource and Development 12 (1) 55-57, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

APPLICATION OF EMPIRICAL EQUATION FOR ESTIMATING THE INTERNAL PRESSURE FROM DENSITY AND ULTRASONIC VELOCITY DATA

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Received : 26.04.2017

Accepted : 28.05.2017

ABSTRACT

On the basis of dimensional analysis, an equation is obtained for estimating the internal pressure, a fundamental property of liquid state measuring the magnitude of cohesive forces, from density and ultrasonic velocity data. This equation has been applied to eight binary, four tertiary and three quaternary liquid mixtures depending on the availability of ρ and u data. Keeping in mind the empirical nature of equation and the uncertainty in the experimental data, the agreement is quite satisfactory.

Keywords : Empirical equation, internal pressure, ultrasonic velocity

INTRODUCTION

In the interior of a liquid there is a balance between the attractive and repulsive forces and this gives rise to what is called the internal pressure, $P_{int.}$ The internal pressure is also defined as the difference between the thermal pressure and the external pressure i.e,

$$P_{int} = (\partial E/\partial V)_T = T\ (\partial P/VT) - \underline{P} \quad \text{.....(i)}$$

Internal pressure as a fundamental property of liquid state has been recognized, since long, by several workers [1]. It is also very powerful thermodynamic property which has been employed to assess the nature of molecular interaction occurring in liquids and solution [2]. There are several methods for the determination of internal pressure. The most accurate method is to measure directly the thermal pressure coefficient, $(\partial P/\partial T)_v$ and use eq (i) to get $P_{int.}$. Also, the other precise method for the determination of $P_{int.}$ is to measure the isothermal compressibility, β_T and thermal expansibility, α, and employ equation.

$$P_{int} = \alpha/\beta_T - \underline{P} \quad \text{----------(ii)}$$

A less effective approach for obtaining the value of P_{int} has been advocated by Suryanarayan and co workers [3] based on the free volume - viscosity consideration. In this method we need viscosity, density, sound velocity and effective molar mass with a geometric factor depending on the types of liquid. Many workers [4] have employed this approach. A most comprehensive and critical review on the various aspects of internal pressure has been presented very recently by Marcus [5].

The present work deals with utility of density and ultrasonic velocity data in estimating the very useful data and is part of thermodynamic property and the internal pressure. The techniques involved for the accurate determination of density and ultrasonic velocity are very simple and economical. On the basis of dimensional analysis Singh [6] obtained the expression for thermal expansibility, α and isothermal compressibility, β_T and thus internal pressure $P_{int.}$ in terms of density, ρ and ultrasonic

velocity, u. Without testing the validity of these expressions, some workers [7] employ these for their specific purpose. The aim of the present works is to test the validity of these empirical relations by computing the values of P_{int} for liquid mixtures (binary, tertiary and quaternary) from ρ and u data available in the literature.

FORMULATION

Singh [8] deduced the following relations for α and β_T in terms of ρ and u;-

$$\alpha = 75.6\times10^{-3}/T^{1.9}.\rho^{1/3}.u1^{/2} \quad \text{---------- (iii)}$$

$$\beta_T = 1.71\times10^{-3}/T^{4.9}.\rho^{4/3}.u2 \quad \text{---------- (iv)}$$

From these relations we arrived at the relation, using eq (ii),

$$P_{int} = 44.2\, T^{4/3}\rho u^{3/2} \quad \text{---------- (v)}$$

RESULTS AND DISCUSSION

We have applied eq. (v) to eight binary, four tertiary and three quaternary liquid mixtures. The details of these mixtures are given in table 1, 2 and 3 respectively. For using eq. (v) for computing the internal pressure, P_{int}, we need only the experimental data of density (ρ) and ultra sonic speed (u) at the ambient temperature T. The data have been collected from different sources. [8,9]

Average Percentage Deviations of Calculated P_{int} Values

Table 1: Binary Liquid Mixture

.No.	Liquid Mixtures	T^0K	APD%
1	Benzene + ethylene dichloride	293.15, 303.15, 313.15, 323.15, 333.15 and 343.15	3.1
2	Benzene + carbon tetrachloride	298.15	6.7
3	Acetone + Chloroform	293.15 303.15, 313.15 and 323.15	5.7
	Acetone+ carbon disulphide	293.15, 303.15 and 313.15	6.8
	Cyclohexane + Benzene	298.15	3.9
	n-Hexane + Cyclohexane	298.15	5.1
	n-Hexane + Benzene	298.15	5.0
	n-Decane + Cyclohexane	298.15	2.2

1 enlists the values of Average Percentage tions (APD) in the theoretical values of P_{int} for binary mixtures as mentioned in the table with the temperature at which the calculations were performed. It is interesting to note that APD values are 3.1, 6.7, 5.7, 6.8, 3.9, 5.1, 5.0 and 2.2 percents respectively. Maximum APD is 6.8 % giving reasonable good agreement.

Table 2: Ternary Liquid Mixtures

	Liquid Mixtures	T^0K	APD%
	Cyclohexane + n-Heptane + Toluene	298.15	3.3
	Toluene + n-Heptane + n-Hexane	298.15	4.2
	n-Pentane + n-Hexane + Benzene	298.15	9.5
	n-Hexane + Cyclohexane +Benzene	298.15	4.4

Table 3: Quaternary Liquid Mixtures

S.No.	Liquid Mixtures	T^0K	APD%
1	n-Pentane + Toluene + Heptane + Cyclohexane	298.15	3.3
2	n- Decane + n-Hexane + Cyclohexane + Benzene	298.15	3.4
3	n-Pentane + n-Hexane + Benzene + Toluene	298.15	3.5

For four tertiary liquid mixtures the APD values are recorded in Table 2. Here also the agreement is quite fair. Similarly, the APD values for three quaternary liquid mixtures at 298.15 K are shown in Table 3. There is excellent agreement of P_{int} values with experimental ones.

Lastly we can concluded that keeping in mind the empirical nature of eq. (v) ρ and u values, the agreement is quite good, indicating the validity of eq. (v).

ACKNOWLEDGEMENT

The authors are thankful to Dr. Vinay Sanguri for helpful discussion.

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Journal of Natural Resource and Development 12 (1): 58-64, 2017 | NASS RATING : 5.46 | ISSN-0974-5823

EFFECT OF ETHEPHON 39 % SL ON POSTHARVEST APPLICATIONS ON FRUIT RIPENING IN MANGO

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Received : 25.04.2017 *Accepted : 27.05.2017*

ABSTRACT

The present experiment was undertaken to study the effect of ethephon dip on ripening quality of mango (*Mangifera indica*L.). All the fruits selected for treatment were completely matured and was given through wash with tape water and air dried. Dried mangoes were treated with different concentration of Ethephon and kept with contact with the solution for 10 minutes. Mangoes were put in plastic crates with ventilation at top open sides and bottom in open room to allow the ripening process to progress. Each treatment was considered of 50 Mangoes. Condition of ripening room was minimum 26 to 37 °C and Relative humidity 60 to 80 %. Physical and chemical characteristics analyses were done at harvest time and different days intervals in the time of ripening process. Fruit quality in terms of physiological loss in weight (PLW), fruit firmness, TSS: acid ratio and flesh colour was assessed after 3, 7, 11, 15 days.Mangoes treated were different concentration of Ethephon and untreated showed gradual loss of weight with the change in storage time, Dashehari, and Chaushashowed loss of percentage of ripening with similar pattern. There was no significant difference in loss of weight among the different treatment group indicating pattern is similar to different variety with untreated one.There was no significant difference in colour score among the different treatment at earlier storage time, but the color score at the higher side for the treated Mangoes compare to control on all the storage days.Ethephon 39 % SL made out of imported technical is equally effective in ripening of Mangoes compare to Market sample.In case of 500 ppm compare to 1000 ppm, which gives shorter ripening period consequently shorter shelf life of the Mango, Hence the 500 ppm treatment already recommended by authority is an appropriate dose level for ripening of Matured Mango, Ethephon 39 % SL and Market sample showed equal effects.The results suggested that ripening in mango fruit was induced by ethephon treatments.

Keywords: *Dashehari and chausha,ethephon, ripening, fruit quality*

INTRODUCTION

Mango is the national fruit of India, where it is known as the 'King of Fruits'. The mango fruit is a large, fleshy drupe, containing an edible mesocarp of varying thickness.Mango trees can grow up to 40 m high and are topped with a rounded canopy of foliage. Mango (*Mangifera indica L.*) is the largest fruit being produced in India. India probably has more commercial planting than the rest of the world (Ochse, 1961).Mango fruit is utilized from immature stage to ripeness stage depending upon its use such as chutneys, pickles etc. It is cultivated from northern subtropical states to southern tropical regions of country with wide genetic diversity in varieties.The fruit of mango attains physiologicalmaturity with onset of monsoon season and there isheterogeneous ripening on tree itself which pose problemin transport chain. The

optimum stage of ripeness andeating quality is determined by variety of attributes atspecific step in the supply chain (Padda et al., 2011).Now-a-days fruits are deliberately being contaminated by chemicals like calcium carbide causing serious health hazards.Underlocal conditions fruits are commonly given artificialripening by the use of low-cost calcium carbide (Rahmanet al., 2008) that decomposes to acetylene and results inpoor flavour.It has been reported that if ethylene isapplied exogenously, it helps fruit ripening (Medlicottetal., 1988). Ethephon is one of the most common ethylenegeneratingchemical for post harvesttreatments.Ethephonhas been reported to hasten ripening of several fruits likeapples, cherries, blueberries figs, pineapple, tomatoes,peaches, guava, grapes, citrus and walnut (Watada, 1986;Abeles et al., 1992).The chemical ethephon which produces ethylene upon chemical degradation has been extensively tested on other agricultural crops (De Wilde, R. C. 1971).The average productivity of mango in India is about 6.3 m ha-1(Anonymous, 2006). Mango is also a good source of incomegeneration as 45.35 thousand tons of mango worth 127.41 crorerupees has been exported to the different countries of the world(Anonymous, 2008).India contributes39.5% share of mango in world production (Anonymous, 2008).The objective of the present study was to evaluate the efficacy of different doses of ethephonaspost harvest dip on physico-chemical changes ofDashehari&Chaushamango during ripening under ambient conditions.

MATERIALS AND METHODS

Trials were conducted during June 2014 variety Dashehari and July 2015 for Chausha. The matured Mangoes were harvested from the trees and transported immediately to the experimental station. The Mangoes were selected for the treatment at the various concentration of Ethephon only those were undamaged during the plucking and transportation and also the plucking were made to see any insect's infestation. Only those Mangoes found undamaged and infection free were used in the study. All the fruits selected for treatment were completely matured and was given through wash with tape water and air dried. Dried mangoes were treated with different concentration of Ethephon and kept with contact with the solution for 10 minutes. Mangoes were put in plastic crates with ventilation at top open sides and bottom in open room to allow the ripening process to progress.Each treatment was considered of 50 Mangoes. Condition of ripening room was minimum 26 to 37 °C and Relative humidity 60 to 80 %.Physical and chemical characteristics analyses were done at harvest time and different days intervals in the time of ripening process. No. of fruits taken for analysis of each sample was 10 and analyze for visual assessment of pill, pulp colour etc. various parameters that were analyzed –Physiochemical loss in weight, if any due to treatment, Colour score, Uniformity of ripening, Total soluble solids, Acidity percentage, Reducing sugar percentage,Total sugar percentage

MEASUREMENT OF PARAMETERS

A. Physiochemical loss in weight –

The weight of the fruits in each replication was recorded on every second day and subtracted from the initial weight. The loss of weight in grams in relation to initial weight was calculated and expressed as percentage.

$$\text{PLW } (\%) = \frac{\text{(Initial wt. of fruit – wt. of fruit after storage for a period of the days)}}{\text{Initial wt. (weight)}} \times 100$$

Colour Score -

Colour score of Mango fruits was determined using following scoring system –**Score, 1** – 100 % Green, **Score, 2** – 50 % Green and 50 % Yellow,**Score, 3** – 25 % Green and 75 % Yellow, **Score, 4** – 100 % yellow.In case of Dashehari colour score 4 is given for 50 % Green and 50 % yellow as 50 % skin yellow colour for Dashehari is considered fully ripen.

Uniform Ripening –Uniform ripening in Mango was calculated of Mango fruits reaching a colour of 25 % Green and 75 % yellow for Chausha and in case of Dashehari 60 % Green and 40 % yellow.**Total soluble solids** –Total soluble solids of Mango per sample using recorded Reflectometer

index.**Total acidity** –The total acidity of mango pulp samples were determined by titration method (Ranganna,1986). Ten grams of mango fruit pulp was taken and ground well and taken in a 100 ml beakerand a little quantity of distilled water was added to it. The pulp was boiled for one hour,frequently replacing the water, which was lost due to evaporation. The pulp was cooled,transferred into a 100 ml volumetric flask and the volume was made up. The pulp was filteredusing Whatman No. 4 filter paper and the filtrate was used for analysis.10 ml of filtrate was taken in a conical flask and titrated against 0.1 N NaOH solutions using one or two drops of phenolphthalein indicator. Formation of pink colour was recorded as the end point of titration. Then, the acidity expressed as the percentage of anhydrous citric acid, was calculated as follows:

Factor for acidity = 1 ml of N/NaOH = 0.0064g of the citric acid

$$\text{Total acidity } (\%) = \frac{\text{Total value x N of NaOH x Vol. made up x Factor for acidity}}{\text{Volume of sample x weight of sample x 1000}} \times 100$$

Reducing Sugar –Reducing sugars present in the mango pulp samples were determined by the method of Lane andEyon (AOAC, 1965). Ten grams of mango fruit pulp was ground in a blender. The sample wasthen mixed with 25 to 50 ml distilled water in a 100 ml of volumetric flask and was neutralizedwith 1 N NaOH. For clarification, 2 ml of 45 per cent lead acetate was added and the mixturewas shaken well and allowed to stand for 10 minutes. Necessary amount of 22 per centpotassium oxalate was added to remove the excess lead present and the volume was made up to100 ml with distilled water.The contents were then filtered through Whatman No.4 filter paper and the filtrate was used for analysis. Ten ml of Fehling's solution (to 5 ml of Fehling's A, added 5 ml of Fehling's B) was mixed with 10 ml of distilled water in a conical flask, heated to boil and titrated against the filtrate sample using methylene blue as an indicator. The end point of titration was brick red colour. The results were expressed as percent reducing sugar

$$\text{Reducing sugars } (\%) = \frac{0.05 \times \text{Vol. made up}}{\text{Titre value}} \times 100$$

Total Sugar -Total sugars present in the mango pulp samples were determined by the method of Lane andEyon (AOAC, 1965). A quantity of 25 ml of lead free filtrate (prepared for reducing sugarestimation) was hydrolysed with 5 ml of 6 N HCl at room temperature for 24 hours. Thehydrolysed sample was neutralized with 30 per cent NaOH using a drop of phenolphthalein as anindicator till the pink colour persisted for at least a few seconds. The volume was then made upto 100 ml with distilled water. Total sugars were then estimated by taking this solution in aburette and titrating it against the standard Fehling's solution (mixture of A and B at 5 ml each)using methylene blue as an indicator and taking brick red colour as an end point.

$$\text{Total sugars } (\%) = \frac{0.05 \times \text{volume made up}}{\text{Titre value}} \times 100$$

RESULTS AND DISCUSSION

Physiochemical loss in weight –Mangoes treated were different concentration of Ethephon and untreated showed gradual loss of weight with the change in storage time, Dashehari and Chausha (Table -1) showed loss of percentage of ripening with similar pattern. There was no significant difference in loss of weight among the different treatment group indicating pattern is similar to different variety with untreated one.**Colour Score - Dashehari**– There was no significant difference in colour score among the different treatment at earlier storage time, but the color score at the higher side for the treated Mangoes compare to control on all the storage days.Color score scoring of Dashehari at different dose concentration is given in (Table 2) **&Chausha**– Color scoring of Chausha is depicted in (Table-2).**Uniform Ripening** –Uniform ripening of Dashehari and Chausha is depicted in (Table-3).**Total soluble solids (TSS)** –Significant increase in TSS values were noted in Mangoes treatment with Ethephon at different concentration in comparison with control sample, treated only with the water. Details given in (Table – 4).Similarly, the effect of different concentration of Ethephon treatment on Chausha showed increase in TSS values with the passage of time storage, details given in (Table

4) **Total Acidity** –Acidity of both the variety of Mango investigation showed there is no significant difference in acidity of fruits among various treatments. Showed in (Table – 5).**Reducing Sugar** –Estimation of reducing sugar of different treatment of Dashehari and Chausha provided in (Table -6).

Table 1:Effect of different concentration of Ethephon on the physiological loss in weight (%) of Dashehari & Chausha Mango variety

Treatment		Dose in (ppm)	Days after treatment (Dashehari Mango)				Days after treatment (Chausha Mango)			
			3 days	7 days	11 days	15 days	3 days	7 days	11 days	15 days
T1	Ethephon 39 % SL	500	3.68	7.88	11.22	16.74	3.38	8.86	9.72	18.92
T2	Ethephon 39 % SL	800	3.96	8.62	15.04	18.36	5.02	7.38	10.12	17.77
T3	Ethephon 39 % SL	1000	6.08	10.21	17.72	21.98	3.96	9.22	12.24	20.11
T4	Ethephon 39 % SL (Market Sample)	500	3.96	8.02	12.22	17.06	4.83	11.31	12.44	22.36
T0	Untreated Control	0	4.41	9.44	16.33	24.04	5.22	12.82	13.99	17.51

Table 2:Effect of different concentration of Ethephon on the colour score of Dashehari & Chausha Mango variety

Treatment		Dose in (ppm)	Days after treatment (Dashehari Mango)					Days after treatment (Chausha Mango)				
			3 days	6 days	9 days	12 days	15 days	3 days	6 days	9 days	12 days	15 days
T1	Ethephon 39 % SL	500	1.42	1.5	2.2	2.8	3.2	1.86	2.24	2.52	2.72	3.04
T2	Ethephon 39 % SL	800	1.44	1.58	2.1	3.08	3.4	1.72	2.32	2.42	2.81	3.1
T3	Ethephon 39 % SL	1000	1.64	1.81	1.8	2.44	3.3	1.88	2.41	2.52	2.62	2.98
T4	Ethephon 39 % SL (Market Sample)	500	1.36	1.42	1.66	2.72	3.1	1.77	2.28	2.6	2.7	3.11
T0	Untreated Control	0	1.1	1.18	1.62	2.1	2.2	1.04	1.92	2.11	2.58	2.88

Table 3: Effect of different concentration of Ethephon on the uniformity (%) of ripening of Dashehari & Chausha Mango variety

Treatment		Dose in (ppm)	Days after treatment (Dashehari Mango)					Days after treatment (Chausha Mango)				
			3 days	6 days	9 days	12 days	15 days	3 days	6 days	9 days	12 days	15 days
T1	Ethephon 39 % SL	500	0	4	8	12	30	0.56	7.22	12.88	22.24	24.31
T2	Ethephon 39 % SL	800	0	5.2	6.8	14	32	0.62	8.88	14.32	24.18	25.98
T3	Ethephon 39 % SL	1000	1.5	6	7.8	18	34	0.87	10.42	19.04	27.08	28.16
T4	Ethephon 39 % SL (Market Sample)	500	0	2.8	3.2	11	31	0.62	6.84	15.61	20.17	22.08
T0	Untreated Control	0	0	0	0	6	14	0.24	5.19	8.85	12.36	14.32

Differencebetween different treatments reducing sugar value with both the variety is small however, in case of control it took extended storage period for the higher side of reducing sugar levels.

Total Sugar –Estimation of total sugar showed slight increase in sugar contents of Chausha varieties than the Dashehari and it is also observed at higher concentration, total sugar recorded increased value than control. Total sugar contents of Dashehari and Chausha with the passage of time and amount of Ethephon concentration is showed in (Table –7).

Table 4: Effect of different concentration of Ethephon on the TSS of Dashehari & Chausha Mango variety

Treatment		Dose in (ppm)	Days after treatment (Dashehari Mango)					Days after treatment (Chausha Mango)				
			3 days	6 days	9 days	12 days	15 days	3 days	6 days	9 days	12 days	15 days
T1	Ethephon 39 % SL	500	10.33	15.82	16.3	17.6	19.86	9.82	11.31	12.98	14.52	16.08
T2	Ethephon 39 % SL	800	9.82	16.1	16.2	18.11	20.6	10.29	11.02	11.54	13.43	11.78
T3	Ethephon 39 % SL	1000	11.44	13.6	13.54	19.2	22.14	10.34	11.52	12.23	10.54	9.58
T4	Ethephon 39 % SL (Market Sample)	500	9.82	12.36	12	16.19	20.12	9.78	10.28	11.52	13.41	10.52
T0	Untreated Control	0	6.21	8.02	9.44	9.04	14.33	8.42	9.32	10.12	9.02	10.94

Table 5: Effect of different concentration of Ethephon on the acidity (%) of Dashehari & Chausha Mango variety.

Treatment		Dose in (ppm)	Days after treatment (Dashehari Mango)					Days after treatment (Chausha Mango)				
			3 days	6 days	9 days	12 days	15 days	3 days	6 days	9 days	12 days	15 days
T1	Ethephon 39 % SL	500	0.68	0.24	0.12	0.06	0.02	1.02	0.68	0.42	0.26	0.09
T2	Ethephon 39 % SL	800	0.54	0.41	0.11	0.07	0.01	0.88	0.46	0.22	0.12	0.11
T3	Ethephon 39 % SL	1000	0.48	0.28	0.09	0.09	0.04	0.72	0.39	0.19	0.09	0.06
T4	Ethephon 39 % SL (Market Sample)	500	0.72	0.19	0.08	0.07	0.12	1.1	0.66	0.44	0.24	0.11
T0	Untreated Control	0	0.86	0.8	0.46	0.26	0.02	1.2	1.02	0.82	0.46	0.42

Table 6: Effect of different concentration of Ethephon on the reducing sugar (%) of Dashehari & Chausha Mango variety.

Treatment		Dose in (ppm)	Days after treatment (Dashehari Mango)					Days after treatment (Chausha Mango)				
			3 days	6 days	9 days	12 days	15 days	3 days	6 days	9 days	12 days	15 days
T1	Ethephon 39 % SL	500	1.84	3.14	3.06	3.86	3.88	3.92	8.96	9.94	10.58	12.44
T2	Ethephon 39 % SL	800	2.52	3.82	4.11	3.98	4.22	3.72	6.92	11.02	11.14	13.22
T3	Ethephon 39 % SL	1000	3.2	3.96	4.02	4.4	4.06	4.67	6.82	12.01	11.24	14.01
T4	Ethephon 39 % SL (Market Sample)	500	1.51	3.62	3.16	3.04	3.33	3.2	7.84	10.12	10.91	11.16
T0	Untreated Control	0	1.92	3.36	3.3	4.1	4.23	2.8	6.66	6.91	8.26	10.08

Table 7: Effect of different concentration of Ethephon on the total sugar (%) of Dashehari & Chausha Mango variety

Treatment		Dose in (ppm)	Days after treatment (Dashchari Mango)					Days after treatment (Chausha Mango)				
			3 days	6 days	9 days	12 days	15 days	3 days	6 days	9 days	12 days	15 days
T1	Ethephon 39 % SL	500	6.42	10.59	14.11	14.82	16.37	10.2	12.11	18.92	24.52	28.02
T2	Ethephon 39 % SL	800	8.46	13.33	17.62	17.82	16.65	9.2	13.88	17.52	26.41	27.67
T3	Ethephon 39 % SL	1000	9.99	14.11	21.69	22.36	18.12	10.96	18.44	20.48	23.82	26.99
T4	Ethephon 39 % SL (Market Sample)	500	5.58	9.66	16.24	17.01	15.56	9.81	13.02	20.16	22.84	25.83
T0	Untreated Control	0	5.04	8.33	12.12	12.6	10.23	6.02	12.36	18.08	20.24	21.11

DISCUSSION

Increased weight loss with higher concentration might be due to rigorous effect of ethephon on disorganization of cell wall structure which resulted higher respiration rate (Singh and Tiwari, 1994).Similar increase in weight loss in pear with ethephontreatments were earlier reported by (Dhillon and Mahajan, 2011).In mango firmness is one reliable indicator to judge maturity and ripeness during commercial mango handling and important tool for growers, importers, retailers and consumers (Padda et al., 2011).As the ripening period advanced fruit started to lose their firmness and it declined sharply from 48 hrs of ripening to 96 hrs of ripening period. The fruits were very hard and inedible after 48 hours of ripening period while after 72 hrs of ripening, higher doses of ethephon (400 and 800 ppm) treatments significantly decreased fruit firmnessmaking the fruit fit for consumption. Likewise, decreased fruit firmness in mango with ethephon treatments has been reported by earlier workers (Singh and Janes, 2001; Wang et al., 2009).TSS: acid ratio is vital characteristics in determining the taste and acceptability of fruit. Variouspost harvest treatments significantly affected the TSS: acid ratio of the mango fruit All the ethephon treatment significantly improved TSS: acid ratio of fruit as compared to control. The increase in TSS: acid ratio with ripening was at slower rate up to 96 hr of ripening period; subsequently a abrupt increase in ratio was registered till end of sampling peA similar increase in TSS: acid ratio of mango with ethephon treatment was observed by Singh and Janes (2001).The yellow colour development of mesocarp was at slow rate from 48 hr of ripening after 96 hrs of ripening followed by rapid colour development up to 72 hrs of ripening period. The appearance of yellow colour with ripening is related to accumulation of carotenoids (Medlicott et al., 1986).Mangoes treated were different concentration of Ethephon and untreated showed gradual loss of weight with the change in storage time, Dashehari and Chausha (Table -1) showed loss of percentage of ripening with similar pattern. There was no significant difference in loss of weight among the different treatment group indicating pattern is similar to different variety with untreated one.

CONCLUSION

From the above results it can be conducted that Ethephon 39 % SL made out of imported technical is equally effective in ripening of Mangoes compare to Market sample. Both the samples @ 500 ppm and Market sample also @ 500 ppm having similar capacity of ripening of Mangoes. At 1000 ppm level ripening capacity is certain of storage days compare to 500 ppm, but on the point of your transportation and solubility of the seller ripening of Mangoes faster is not a good proposition as store ripening will give seller more time for selling at price profitable, which is observed in case of 500 ppm compare to 1000 ppm, which gives shorter ripening period consequently shorter shelf life of the Mango, Hence the 500 ppm treatment already recommended by authority is an appropriate dose level for ripening of Matured Mango, Ethephon 39 % SLand Market sample showed equal effects.

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Journal of Natural Resource and Development 12 (1) 65-69, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

FINPUT DEALERS AS EFFECTIVE KNOWLEDGE SHARING PARTNERS

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Received : 25.03.2017

Accepted : 30.04.2017

ABSTRACT

The nation still needs to adopt and fallow better technologies for agro-practices to meet the growing extension demand of farmers. In this line agro-inputs dealers plays a major role as knowledge sharing partners. The local availability and approachability of input dealers among the farmers increases their effectiveness. Keeping these issue in mind the study was conducted in purposively selected Hamirpur district of Bundelkhand region of Uttar Pradesh. The findings of study indicated that in this tract input dealers were more effective compare to other extension agencies in terms of advisory & input delivery services while other agencies including public and private (except input dealers) were dominated in the area of quality of inputs and diagnostic services. The study also showed the cost of services and eco-cidal effect both were higher in case of input dealers. The present investigation concluded that the functioning of input dealers were farmer oriented with profit moto & preserving market share among farmers.

Key words **:** *Input dealers, effectiveness, technology transfer, functioning.*

INTRODUCTION

Strengthening agricultural extension system in India is a difficult and complex problem and there are no panaceas or quick – fix solutions. It is widely acknowledged that less progress has been made in technology transfer than in any other area of agricultural development. For technology transfer it is necessary that when communication – message pass up to farmers then immediately technological package also made available for adoption of technology otherwise farmers action are delayed and message may be forgotten. But this is commonly happen with Indian farmers. Actually, agricultural technology is a complex blend of materials, processes & knowledge. Generally all the extension system either public or private providing only knowledge /knowledge & inputs but not skill to farmers ; so the adoption process of technology is badly affected. Several organizations, institutions, etc. advocated for adoption of location specific modules to farmers for increasing production and productivity but their recommended technological package including required inputs, requisite skills & services as well as material technology, etc either not available or partially available at local level or out of reach ability of farmers. This is a major bottleneck issue affected to technology transfer process.

This problem can be manage by private input dealers upto some extent. Today, private input dealers play a key role in providing input delivery and advisory services. Many information consulting pattern studies indicated that input dealers are consulted by farmers more frequently than other sources. (Sulaiman and Sadamate, 2000 - C). The reasons as reported by farmers are (i) poor contact intensity and difficulty in meeting village level workers (V.L.Ws) when they need information or advice; (ii) long waiting time to meet V.L.W.; (iii)

difficulty in getting V.L.W. field visit if it is far ; (iv) input dealers are preferred due to their easy availability at the local level in different time of crop season. (Sarju Narain and A.K. Singh, 2007). Except above reasons the ratio of VLW and farmers is too large. The input dealers basically a businessman work as crop doctor at local level (even they are not be a technically qualified service provider). This is major draw back and this leads to passing wrong information to farmers. The main objective of input dealers are product promotion and profit maximization through advisory services. Thus, input dealers are very important partners probably they can do extension activities. At present approximate 2.5 lakh input dealers serving extension activities in India (P. Chandras Shekhar, 2011).

Thus, no other available local level network is more effective as input dealers. Keeping this issue in view the present study was under taken with following objectives (i). To study the functioning of selected input dealers and (ii) To know the effectiveness of input dealers in comparison to other extension agencies.

Table-1.Functioning of selected input dealers. (N=100)

S. No.	Profile characteristics	Input dealers perception	Farmers agreeness (%)	
			Agree	Disagree
1	Objectives	• Product promotion and profit maximization as well as preserving market share	100	00
2	Network	• Develop through realibility & incentive basis	69	31
3.	Coverage area	• Surrounding villages extended upto 35 -40 km peripheri of Rath.	78	22
4	Method of contact to farmers	Input promoters/experts of input companies/ (attached to input dealers) personally meet to farmers and provide advisory & diagnostic services (free of cost) for their product promotion.	96	04
	Service delivery mechanism	Farmer direct contact to input dealers or vice -versa through companies sales promoter.	73	27
	Linkage & contact intensity	Based on goodwill of input companies and as need in crop season.	67	33
	Chances of availability of inputs	Maximum chances	87	13
	Rate of inputs to sale	Based on input companies & product (generally on MRP & some time less than MRP)	96	04
	Quality of inputs	Always good	63	37
	Burrowing & other facilities	Only for well known and reputed farmers, some facilities on rent basis/free of cost as depend to relation with farmers.	83	17
	Pattern of charging fee	No directly charg es fee by input dealers & input promoters,	100	00
	Average number of costumers deals per day	About 20-40 per day but it depend upon peakness of agricultural seasons	-	-
	Deals in	Fertilizers / & nutrients, Seeds, pesticides, plant growth & fruiting harmones and hand operated equipment/ machines, etc.	100	00
	Nature of services provided	Input delivery, advisory and diagnostic in nature with requisite skill	66	34
	Services provided to	All farmers who having mood for excepting technology either they purchase inputs or not	65	35

MATERIALS AND METHODS

The study was conducted purposively selected Rath block in Hamirpur district. Out of 22 input dealers two input dealers namely 'Salim Beej Bhandar' and 'Rajpoot Kisan Center' were purposively selected for the study of functioning and to know their effectiveness. The reason for selection of these two input dealers is greater creditability among farmers as well as fair price & availability of inputs as opined by farmers. To study the functioning of input dealers profile information discussed with input dealers and recorded for farmers opinion. To know the effectiveness of these two input dealers 100 farmers were randomly selected during market / Mandi days in Rath. These selected farmers showed representative sample of different surrounding villages up to 40 km away from Rath block. The opinion of farmers as respondents were individually collected in several points & issues. The collected data were tabulated and analysed in the light of objectives. The study was conducted during month of April to July, 2013.

RESULTS AND DISCUSSION

For study of functioning of input dealers the profile information was collected from Saleem Beej Bhandar Coat bazaar, Rath and Rajpoot Beej Bhandar near bus stand Rath based on discussion and presented here. Farmers opinion were recorded against functioning as presented through table 1.

Table 1 revealed that functioning of selected input dealers were need based, demand driven & profit oriented. There all activities including farmers related services were totally based on above objectives. Farmers agreeness percentage also supported to perception of input dealers.

Table 2(a)- Comparative effectiveness of input dealers and other extension agencies based views expressed by respondents.

S. No.	Effectiveness criteria	Farmers views for	
		Input dealers	Other extension agencies
1	Nature of services provided	Advisory, input delivery and diagnostic	Advisory input delivery and some times diagnostic
2	Linkage & relation with farmers	Always good but intensity of goodness based on input purchasing capacity	Occasionally good
3	Farmers coverage	All categories especially who like to purchase inputs	Mostly prosperous farmers have reachability & perusing capacity
4	Benefit in terms of Rs.	Maximum chances but sometimes unfruitfull	as same as input dealers
5	Availability of services at local level	Timely & need based demand driven	Supply driven
6	Quality of services	good in maximum cases	as same as input dealers
7	Applicability of technology	High to medium	High to medium
8	Farmers belief	More compare to other extension agencies	Less compare to input dealers
9	Incentives	Available to only selected farmers	Not available
10	Generation wise contact intensity	Youth farmers more contact	Youth farmers more contact
11	Contact intensity of farmers	2-4 times in season or as required	1-2 times in a season or as required
12	Application of chemicals is skill based activity learn by always available	Input dealers	Not always available
13	Education & skill of input dealers	Necessary to be well educated	Experience expertise available
14	About input use	promote excessive use for profit maximization	Appropriate use

Table 2 (b)- Comparative effectiveness of input dealers and other extension agencies.N = 100

S. No.	Effectiveness criteria	Farmers opinion about							
		Input dealers				Other extension agencies			
		Low	Medi-um	High	Mean	Low	Medi-um	High	Mean
1	Input delivery services	07	37	56	2.49	13	58	29	2.16
2	Advisory services	12	42	46	3.34	27	46	27	2.00
3	Diagnostic services	27	47	26	1.99	19	37	44	2.25
4	Incentive services**	28	12	00	0.52	0	0	0	00
5	Cost of services	00	47	53	2.53	17	66	17	2.00
6	Quality of inputs	17	27	56	2.39	12	30	58	2.46
7	Applicability of technology	13	33	54	2.41	33	36	31	1.98
8	Role in skill development of farmers	33	44	23	1.46	67	16	17	1.50
9	Relation & linkage	27	65	08	1.81	68	30	02	1.34
10	Contact intensity by farmers	23	67	10	1.87	66	30	04	1.38
11	Eco-cidal effect	29	30	41	2.12	37	37	26	1.89
12	Farmers belief	15	46	39	2.24	13	57	20	1.87

2. Effectiveness of Input dealers in comparison to other extension agencies.

* Frequency N also indicate percentage.

** Incentive services provided to only selective farmers (not for all and not it high level). In case of input dealers 60% respondents were not received any type of incentives.

Table 2(b) revealed that input dealers were more effective compare to other extension agencies in terms of advisory services with mean value 3.34 followed by input delivery services (2.49 mean value), applicability of technology (2.41 mean value), on farmers belief (2.24 Mean Value), relation & linkage (1.81 mean value), contact intensity by farmers (1.87 mean value), and terms of incentive services (0.52 mean value). While other extension agencies including public and private sectors (except input dealers) were dominant in the area of quality of inputs (2.46 mean value) and in diagnostic services with mean value of 2.25. Table also showed that cost of services and eco-cidal effect both were higher in case of input dealers as compare to other extension agencies. Among both issues, the issue of eco-cidal effect is too harmfull for our environment and agriculture sustainability. Therefore, an urgent need of taking attention in this issue. The findings was found similar to the result given by A.K. Singh (2006).

CONCLUSION

This study concluded that private agricultural input dealers generally provides input delivery, advisory and diagnostic (limited) services with objectives of product promotion, profit maximization and preserving market share. Due to local availability and reachability of farmers to input dealers, they were more consulted by farmers incomparision to other extension agencies. Therefore, input dealers work as untrained crop doctors at local level and same time they prescribed more use of inputs especially pesticide which are harmfull for agriculture as well as flora & fauna. The findings also showed that input dealers were more effective compare to other extension agencies in terms of advisory and input delivery services while other agencies including public and private (except input dealers) were dominated in the area of quality of inputs and diagnostic services.

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Journal of Natural Resource and Development 12 (1) 70-73, 2017 | NASS RATING : 3.46 | ISSN-0974-5033

SOLID WASTE MANAGEMENT & SUSTAINABLE DEVELOPMENT IN INDIA: AN OVERVIEW

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Received : 13.04.2017

Accepted : 15.05.2017

ABSTRACT

As the economic development takes place in a country the generation of the municipal solid waste also increases. Not only thisbut the characteristics of the municipal solid waste also changes. The issue of Solid Waste Management is very much concern with the Sustainable Development. This research paper is based on the secondary source of data from the National and International literatures. In this paper there is an brief analysis of the issue of Solid Waste Mangement (SWM) with the Sustainable Development in India.

Key words: *Municipal solid waste, Sustainable development, Economic Development etc.*

INTRODUCTION

Human activities create waste and these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health (Saxena et al., 2010; Zhu etal.,2008). Economic development, urbanization and improved living standards in cities increase the quantity and complexity of generated solid waste (Gidde et al., 2008; Rathi, 2007).

In discussing solid waste, generally and traditionally certain categories of wastes are well recognized as they are very ncommon. For example, solid wastes include domestic, commercial, industrial, (due to construction and demolition), agricultural, institutional and miscellaneous. Many times domestic and commercial wastes cannot be differentiated and are considered together as urban wastes (Syed, 2006).

According to Mizpah et al. (2009) integrated waste management is an accepted approach for management of solid waste in developed and developing nations both. Shekdar et al. (1991) investigated that population of urban areas of India is increasing very fast as a result of industrial growth in urban areas due to which municipalities are facing problems to provide basic civic facilities to people including waste management. Seadon (2006) clarified that solid waste management is at least four millennia old issue, which forces us to think about the integrated solid waste management. Read (1999) formulated that policies regarding waste management are being important social and political concerns throughout the world. Rhyner (1992) claimed that the design of a solid waste management system depends on waste quantities predictions with

long and short term variations occur in it. According to Ciuta (2015) analysis of generation rates and composition of solid waste helps in improvement of the waste management system and recycling of waste.

Metin et al. (2003) concluded that proper management of solid waste needs suitable data on a long term basis with higher frequencies and reliable statistics. The proper disposal and management of Solid Waste is the urgent need of the hour to develop our country in a Sustainable way.

MATERIALS AND METHODS

The present study is based on the secondary data collected from different Journals, Magazines and published data relating to Solid Waste, Solid Waste Management and Sustainable Development. Various Journals, books and studies on the subject have been referred in this study. Different sites including the Govt. of India"s official veb. sites have also been searched for collection of data for this study.

Solid Waste

Municipal solid waste (MSW) refers to the materials discarded in the urban areas, for which municipalities are usually held responsible for collection, transport and final disposal. MSW encompasses household refuse, institutional wastes, street sweepings, commercial wastes, as well as construction and demolition debris. In developing countries, MSW also contains varying amounts of industrial wastes from small industries, as well as dead animals, and fecal matter.

Municipal Solid Waste (MSW):

Italso called urban solid waste, and is a waste type that includes predominantlyhousehold waste (domestic waste) with sometimes the addition of commercial wastes, construction and demolition debris, sanitation residue, and waste from streets collected by a municipality within a given area. They are in either solid or semisolid form and generally exclude industrial hazardous wastes.

MSW can be broadly categorized into five broad categories as- **1-Biodegradable waste:** food and kitchen waste, green waste (vegetables, flowers, leaves, fruits), paper (can also be recycled). **2-Recyclable material**: paper, glass, bottles, cans, metals, certain plastics, etc. **3-Inert waste**: construction and demolition waste, dirt, rocks, debris.**4-Composite wastes:** waste clothing, tetra packs and waste plastics such as toys.**5-Domestic hazardous waste** (also called "household hazardous waste") **6-Toxic waste:** medication, e-waste, paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and pesticide containers, batteries, shoe polish. Sources of waste.

Solid Waste Generation & its Characteristics:

The quantity and characteristics of solid waste vary from place to place. Factors that influence the quantity and composition are the average income level, the sources, the population, social behavior, climate, industrialproduction and the market for waste materials (Lateand Mule, 2013; Yadav and Devi, 2009). The present annualquantity of solid waste generated in Indian cities hasincreased from 6 million tons in 1947 to 48 million tons in1997 and to 90 million tons in 2009 and it is expected toincrease to 300 million tons by 2047 (TEDDY, 2010; Sharholy et al., 2006).

Solid Waste Composition:

Waste composition depends on a wide range of factors such as food habits, cultural traditions, climate and income (Srivastavaet al., 2014; Patle et al., 2014; Naveen et al., 2013; Gupta et al., 2013; Kumar et al., 2009). Many categories of municipal solid waste are found such as food waste, rubbish, commercialwaste, institutional waste, street sweeping waste, industrial waste, construction and demolition waste, and sanitation waste. Municipal solid waste contains compostable organic matter (fruit and vegetable peels, food waste), recyclables (paper, plastic, glass, metals, etc.), toxic substances (paints, pesticides, used batteries, medicines), and soiled waste (blood stained cotton, sanitary napkins, disposable syringes) (Kausalet al., 2012; Upadhyay et al., 2012; Reddy and Galab, 1998). Of these, papers, plastics, yard debris, food waste, wood, textiles, disposable diapers, bones, leather and other organics are combustible materials although glass, metal and aluminiumare non-combustible materials (Srivastava et al., 2014; Denisonand Ruston, 1990). The composition of municipal solid waste at generation sources and collection points was determined on a wetweight basis and it consistsmainly of a large organic fraction (40%–60%), ash and fine earth (30%–40%), paper (3%–6%) and plastic, and glass and metals (each less than 1%). The C/N ratio ranges between 800 and 1000 kcal/kg (Sharholy et al., 2008).

Solid Waste Management and Sustainable Development:

Sustainable Development is the need of the present globalized era and waste generation activity is also an essential part of the development activities for the all-round development of our country. In the development of our country in a sustainable way, it must be the way of our life style as-well-as at the individual, societal, and nation level. Over the past few

RESULTS AND DISCUSSION

MSWM in the Third World is unsatisfactory. The improper management of solid wastes represents a source of air, land and water pollution, and poses risks to human health and the environment. Despite considerable expenses, the situation tends to further deteriorate due to the rapid growth of cities likely to occur over the next few decades. That's why to attain the Sustainable Development in India, there is an urgent need for the Solid Waste Management.

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