Effect Of Country Made Liquor On Seed Germination, Growth And Productivity Of Abelmoschus Esculentus

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Abstract
In India, a leading Newspaper Times of India published an unconfirmed report citing the use of Country Made Liquor (CML) by the farmers in the National Capital Region (NCR) Gurgaon for the cultivation of Brinjal crop. It was reported that use of CML increased the production of Brinjal by 06 to 08 times. The Brinjal thus produced were reported to be of good quality and appearance. Earlier the experiment was conducted to study the productivity and growth behaviour of brinjal *Solanum melongena* .var. BR-112 with country made liquor under field conditions and this time an experiment was conducted with ***Abelmoschus esculentus***to study the effect of Country made Liquor on the productivity and growth behaviour of okra (bhindi).The seeds of ***Abelmoschus esculentus*** were sown at the depth of 2.5cm. with different treatments i.e. S1 (soil+ spray of 10% country made liquor original conc.36.0%v/v + at the time of sowing and at 3 days intervals thereafter), S2 (control- without CML), S3 (soil +spray of 10% country made liquor original conc.36.0%v/v + only at the time of germination and at 3 days intervals thereafter) and S4 (soil+ spray of 10% country made liquor original conc.36.0%v/v+ only at time of flowering and at 3days intervals there after).500seedsof each treatment were used for study. Total numbers of germinated plants were counted from each set of all treatments, at the interval period of 5 days after sowing, and reported as emergence count. For growth study shoot length, number of leaves, length and width of leaves and root length were measured from all the treatments. Root length of the plants is measured only till April 27th 2022 because after this the root of the plants get very long and make it very difficult to remove it from the field. Further more,microbial analysis of the soil was also done in which the Lasy's finger seeds (*Ablemoschus esculentus)*were shown. This analysis was done to check the changes in the soil. This analysis involved serial dilution of 1gm of the soils ample upto10 to the power-6followed by pouring of the sample in sterilized PDA and NA plates. These were incubated at 25°C For fungus andat30°C(NA) for bacteria. After incubation,the colony count of fungal and bacterial colonies was done and compared with in intervals of 5days. Country made liquor application certainly affected the Lady's fingers plant. After CML application, the microbial diversity present in the soil also showed considerable variation. For enumeration of the micronutrients and macronutrients soil sample of all the 4 treatments was tested and the presence of available metals were also confirmed. The result revealed that CML treated batch S1 showed germination count if 500 plantlets from 500 seeds, control batch S2 showed 395 plantlets out of 500 seeds, batch S3 (soil+10% spray CML at time of germination with original conc. 36.0%v/v) showed 440 plantlets out of 500 seeds and S4 (soil+10% spray CML at time of flowering with original conc.36.0%v/v) showed 415 plantlets out of 500 seeds. After 20 days of growth S1 plantlets also showed maximum average plant height (8.1cm),number of leaves (5.0) average length of leaves (4.0cm), and average width of leaves(3.1cm) and average tap root length(8.8cm) as compared to control S2 plant height (12.6cm), number of leaves (6.0cm), length of leaves (4.1cm), width of leaves(3.7cm),root length(15.4cm).The germination and flowering number was higher in case of S1 followed by S3 and S4,and least was observed in S2.

Keywords: Abelmoschus esculentus; Country made liquor; Seed germination

Introduction

Okra ***Abelmoschus esculentus*** L. (Moench), is a tropical crop that is also grown in sub-tropical regions of the globe. It is a vegetable crop which haseconomic importance. Okra is grown both as a garden crop and on huge commercial farms. It is commercially farm in Japan, South East Asia (Malaysia, Burma, Bangladesh, India, Pakistan, Afghanistan), Middle East (Turkey, Iran, Cyprus), Yugoslavia,Ethiopia, Ghana, Western Africa,Brazil, and the southern regions of the United States. India ranks first in the world with 3.5 million tones (70% of the total world production) of okra produced from over 0.35 million ha of land (FAOSTAT2008).

Okra is known by many regional names across different regions of the globe. In England, the United States of America, Spain, Portugal, and India, these dishes are known as lady's finger, gumbo, guino-gombo, guibeiro, and bhindi, respectively. It is popular in India because to its ease of cultivation, tolerance to changing moisture conditions, and

consistent output. Even within India, different names have been given in different regional languages (Chauhan, 1972). Okra fruitis fibrous containing round, white seeds inside them. When fruits are immature,they are harvested. The roots and stems of okra are used for cleaning the cane juice from which gur or brown sugar is prepared (Chauhan, 1972). In certain regions, its ripe seeds are roasted, pulverised, and used as a replacement for coffee. The paper business uses mature fruits and stems containing crude fibres. Okra seed extracts are being considered as an alternate source of edible oil. The greenish yellow edible oil has a good flavour and odour and is abundant in unsaturated fats such as oleic acid and linoleic acid. The oil content of the seed is quite high at about 40%.Okra provides an important source of vitamins, calcium, potassium and other mineral matters which are often lacking in the diet of developing countries (IBPGR, 1990). The composition of edible portion of okra is given in table 1(Gopalan et al., 2007). Okra is said to be very useful against genito-urinary disorders, spermatorrhoea and chronic dysentery (Nadkarni, 1927). Its medicinal value has also been reported in curing ulcers and relief from hemorrhoids (Adams, 1975). TAXONOMY, GEOGRAPHIC ORIGIN ANDDISTRIBUTION

Taxonomy

Okra was earlier included in genus Hibiscus, section Abelmoschus in the family Malvaceae (Linnaeus, 1753). The section Abelmoschus was subsequently proposed to be raised to the rank of distinct genus by (Medikus, 1787). The wider use of Abelmoschus was subsequently accepted in the taxonomic and contemporary literature (Hochreutiner, 1924). This genus is distinguished from the genus Hibiscus by the characteristics of the calyx, spathulate, with five short teeth, connate to the corolla and caduceus after flowering (Kundu and Biswas 1973; Terrell and Winters 1974).

Table 1: Composition per 100 g of edible portion

Nutrition Okra, raw	
Nutritional value per 100 g (3.5 oz)	
Energy	33 kcal (140 kJ)
Carbohydrates	7.45 g
Sugars	1.48 g
Dietary fiber	3.2 g
Fat	0.19 g
Protein	2.00 g

.Figure 1 depicts the spread of wild and farmed Abelmoschus esculentus species. Both cultivated and wild species strongly overlap in Southeast Asia, which would be considered the centre of variety. The proliferation of the other species is due to their transfer to America and Africa.

Materials and methods

Experiment was performed for the effect of CML on the growth of Okra. Plant factors which was considered under study was germination and growth behavior of plant i.e. Plant length, number of leaves per plant, and leaf length and breadth per plant.

The current investigation was carried out with the goal of determining the effect of Country made Liquor on seed germination and growth of Lady's fingers. The research employed the following treatments.

1. Soil + Spray of 10% solution of CML at the time of Sowing Only: S1
2. Control (onlysoil):S2
3. Soil+Spray10% solution of Country made Liquor (Original Concentration36%V/V)at the time of germination ;Only: S3
4. Soil+Spray10% solution of Country made Liquor (Original Concentration 36%V/V)at the time of flowering ;Only: S4.

Some important description is given below:
Total number of seeds used for the experiment: 2000
Numberofseedsusedineachtreatment:500
Country made liquor used in S1 treatment: 10% dilution (Original Concentration 36 % V/V)

The country made liquor was sprayed on the day sowing of seed in S1 treatment as well as after every 03 days of interval, in S3 the CML was sprayed only at the time of germination and in S4 the CML was sprayed only at the time of flowering. There wasn't any usage of home-brewed liquor in the S2 therapy. The total number of sprouted seedlings from all treatments were counted and reported as the emergence count 5 days after seeding. Plant growth was measured using several metrics such as shoot length, total number of leaves, leaf length and breadth, and root length. At the end of the germination count, five normal seedlings were chosen at random for the investigation of shoot length, number of leaves, and length and breadth of leaves, all of which were measured in centimetres. Five plants from each treatment were chosen at random to evaluate the root length, which was also utilized to test the other growth parameter, and the mean values were determined at various stages of growth. Flowers were firstly noticed on April, 19th 2022 in S1 treatment and in S2,

S3 and S4 treatment flowers appeared on May, 21st 2022 the numbers of flowers were counted immediately after emergence of flowers with intervals of 03 days. After the emergence of the flowers in all the four treatments fruits emerged within in 3-4 days. Fruit count was taken from 28th April up to 22nd may 2022. Fruits emerged in each treatment were collected and a fruit count was compiled which is shown in the form of table.

Detailed method

The current investigation was carried out with the goal of determining the impact of CML. (original conc. 36%v/v) on the growth of Lady's fingers.

The field divided into four parts each having 500 seeds. Spread compost on the field and Seeds were planted at the depth of 2.5 cm.

As mentioned earlier following treatments were used:-

S1:- 500 seeds sown in soil and manure mixture with 10% sol. of CML. (original conc.36%v/v) on theday of sowing of the seed and also at the period of 03 days following seeding.

S2:- 500 seeds as control were planted in soil and manure mixture without spraying CML.

S3:-500 seedlings were seeded in a soil and manure mixture and sprayed with a 10% solution of CML (original conc. 36%v/v) at the start of germination and every three days afterwards.

S4:- 500 seeds sown soil and manure mixture, sprayed with 10% solution of CML (original conc.36%v/v) at the onset of flowering only and at intervals of 03 days thereafter.

On March, 17th 2022 soil sample was collected from the field which is free from compost for soil profiling and culture growth of microorganism present in the soil of the field. Growth parameters were observed and measured every 5 days. This was continued for 16 weeks soil analysis was carried out before adding manure and after CML application at regular interval of time. The pH of soil was measured, organic carbon content of soil was also determined. Available percentage of major macronutrient like Potash, Phosphate and minor micronutrient like Zinc, Manganese, Iron, Sulphur, and Copper was also determined.

Macro and micronutrients soil sample was analyzed for checking the nutrient value of the soil in soil testing center Ghaziabad from all the treatments which are as follows:

Sample 1(Soil without manure)

Sample 2(Soil with manure)

Sample 3(Soil with the spray of CML)

Seeds were sown on March, 21th 2022 and then at 5-day intervals, the maximum count of germinated seedlings from all treatments was tallied and the result is as shown below in Table 2.

Table: 2. Effect of different treatments on germination/ emergence:

Treatments	Germination/Emergence Counts				Total
	1-5 DAYS	5-10 DAYS	10-15 DAYS	15-20 DAYS	
S1	0	195	205	100	500
S2	0	130	150	105	385
S3	0	160	190	110	460
S4	0	145	175	105	425

In the treatment, S1 no germination was noticed initially but after 5-10 days 195 seeds germinated, this treatment showed quite high emergence count in 5-10 days as compared to S2 i.e. 195 compared to 130 of S2. Next 5 days 205 more seeds showed germination making germination count of this treatment 400 in 10-15 days. Finally, after 15-20 days 100 more seeds germinated making a grand total of 500 in 20 days in this treatment.

In the treatment, S2 on first 5 days no germination took place but after 5-10 days 130 seeds are germinated. After 10-15 days 150 more seeds germinated making total emergence count to be 280.

Finally, after 15-20 days 105more seeds were germinated making grand total of emergence count to be 385 in 20 days.

In treatment, S3 on first 5 days no germination was noticed initially but after 5-10 days 160 seeds are germinated in next 10-15 days, 190 more seeds germinated making a total emergence count to be 350. Finally, after 15-20 days 110 more seeds are germinated making grand total of emergence count to be 460 in 20 days.

In treatment, S4 results of emergence count were not much different from S1 treatment in this treatment no germination was noticed initially but after 5-10 days 145 seeds are germinated in next 10-15 days, 175 more seeds germinated making a total emergence count to be 320. Finally, after 15-20 days 105 more seeds are germinated making grand total of emergence count to be 425 in 20 days.

These edlings in 4different areas S1,S2,S3and S4 on April 16–2022 were taken to study all the parameters of seedling growth i.e. ShootLength, root length,width and length of leaves. This study of ***Abelmoschus esculentus*** growth was

repeated At the interval of 5days and was started after15days of sowing seeds i.e.fromApril,7th2022.Five plants from each treatment is selected randomly form easurement of shoot length, root length, leave length, leave width and number of leaves and the average of these plant is taken for their respective treatment measurements. It was observed that there was a gradual increase in Shoot Length,root length, length and width of leaves fromApril,7th2022toJune,11th2022with no anomaly

Table: 3. Status of growth of *Abelmoschus esculentus* on 7th April

S.No.	Treatment	Root Length (cm)	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	2.6± 0.5	1.5± 0.5	2.4 ± 0.5	0.66 ± 0.1	3 ± 1
2.	S2	4.1± 0.5	3.7± 0.5	2.9 ± 0.5	0.69 ± 0.1	3 ± 1
3.	S3	3.6 ± 0.5	2.9± 0.5	2.7 ±0.5	0.66 ±0.1	3 ± 1
4.	S4	3.9±0.5	3.6±0.5	2.8±0.5	0.668±0.1	3 ± 1

Table: 4. Status of growth of *Abelmoschus esculentus* on 12th April

S.No.	Treatment	Root Length (cm)	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	3.3± 0.5	3.0± 0.5	2.4 ± 0.5	2.0 ± 0.5	5 ± 1
2.	S2	8.9± 0.5	9.3± 0.5	3.1± 0.5	2.1 ± 0.5	5 ± 1
3.	S3	7.5 ± 0.5	8.4± 0.5	2.9±0.5	2.0 ±0.5	5 ± 1
4.	S4	8.5±0.5	9.0±0.5	3.0±0.5	2.0±0.5	5 ±1

Table: 5. Status of growth of *Abelmoschus esculentus* on 17th April

S.No.	Treatment	Root Length (cm)	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	4.5± 0.5	4.0± 0.5	2.7± 0.5	2.5 ± 0.5	5± 1
2.	S2	11.9± 0.5	10.3± 0.5	3.2± 0.5	2.9± 0.5	6± 1
3.	S3	9.0 ± 0.5	9.7± 0.5	3.0 ±0.5	2.6 ±0.5	6 ± 1
4.	S4	10.3±0.5	10.1±0.5	3.1±0.5	2.7±0.5	6 ± 1

Table: 6. Status of growth of *Abelmoschus esculentus* 22th April

S.No.	Treatment	Root Length (cm)	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	5.1± 0.5	4.4± 0.5	2.9± 0.5	2.7± 0.5	5± 1
2.	S2	13.1 ± 0.5	12.7± 0.5	3.5± 0.5	3.3± 0.5	6± 1
3.	S3	10.5± 0.5	10.9 ± 0.5	3.2 ±0.5	2.8 ±0.5	6 ± 1
4.	S4	12.8±0.5	12.2±0.5	3.3±0.5	3.0±0.5	6 ± 1

Table: 7. Statusofgrowthof*Abelmoschus esculentus*27thApril

S.No.	Treatment	Root Length (cm)	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	8.8± 0.5	6.8± 0.5	4.0± 0.5	3.2± 0.5	5± 1
2.	S2	15.3± 0.5	14.0± 0.5	5.5± 0.5	4.3± 0.5	6± 1
3.	S3	11.1± 0.5	11.5± 0.5	4.2±0.5	4.0 ±0.5	6 ± 1
4.	S4	14.0±0.5	13.7±0.5	4.9±0.5	4.1±0.5	6 ± 1

Table:8.Statusofgrowthof*Abelmoschusesculentus*2ndMay

S.No.	Treatment	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	8.9± 0.5	4.6± 0.5	3.6 ± 0.5	8± 1
2.	S2	17.7± 0.5	6.1± 0.5	5.9 ± 0.5	10 ± 1
3.	S3	13.4 ± 0.5	5.1 ±0.5	5.4 ±0.5	8 ± 1
4.	S4	17.5 ± 0.5	6.0±0.5	5.6±0.5	9 ± 1

Table: 9. Status of growth of *Abelmoschus esculentus* on 7th May

S.No.	Treatment	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	9.4± 0.5	5.4± 0.5	4.1± 0.5	8± 1
2.	S2	20.1± 0.5	6.8± 0.5	6.2± 0.5	13± 1
3.	S3	15.3 ± 0.5	6.7 ±0.5	5.9 ±0.5	12 ± 1
4.	S4	19.6 ± 0.5	6.6±0.5	6.0 ± 0.5	12± 1

TABLE: 10. Status of growth of *Abelmoschus esculentus* on 12th May

S.No.	Treatment	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	10.9± 0.5	5.6± 0.5	5.2± 0.5	8± 1
2.	S2	23.5± 0.5	6.9±0.5	6.8± 0.5	18 ± 1
3.	S3	18.7 ± 0.5	6.0 ±0.5	6.1 ±0.5	15 ± 1
4.	S4	23.1±0.5	6.8 ± 0.5	6.5±0.5	18 ± 1

Table: 11.Status of growth of *Abelmoschus esculentus* on 17th May

S.No.	Treatment	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	12.0± 0.5	5.8 ± 0.5	5.2± 0.5	10± 1
2.	S2	26.9± 0.5	7.9±0.5	6.9± 0.5	20± 1
3.	S3	23.8 ± 0.5	6.7 ±0.5	6.3 ±0.5	15 ± 1
4.	S4	25.0 ± 0.5	7.8±0.5	6.7 ± 0.5	18 ± 1

Table: 12. Status of growth of *Abelmoschus esculentus* on 22nd May

S.No.	Treatment	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	13.2± 0.5	6.4± 0.5	5.8± 0.5	13± 1
2.	S2	27.1± 0.5	8.4±0.5	7.6± 0.5	22± 1
3.	S3	24.9 ± 0.5	7.3 ±0.5	6.8 ±0.5	16± 1
4.	S4	25.7±0.5	8.0±0.5	7.2±0.5	20± 1

Table: 13. StatusofgrowthofAbelmoschusesculentuson27thMay

S.No.	Treatment	Shoot Length (cm)	Length of Leave (cm)	Width of Leave (cm)	No. of Leaves
1.	S1	18.4± 0.5	7.0± 0.5	6.8 ± 0.5	15± 1
2.	S2	33.5± 0.5	10.2±0.5	8.3± 0.5	25 ± 1
3.	S3	27.5 ± 0.5	8.1 ±0.5	6.9 ±0.5	17± 1
4.	S4	32.1±0.5	9.7±0.5	7.5±0.5	21± 1

Table: 14. StatusofgrowthofAbelmoschusesculentus0n1stJune

S.No.	Treatment	Shoot Length (cm)	Length ofLeave (cm)	WidthofLeave (cm)	No.ofLeaves
1.	S1	22.2± 0.5	7.1± 0.5	6.8± 0.5	15± 1
2.	S2	40.1± 0.5	12.4±0.5	9.0± 0.5	26± 1
3.	S3	28.9 ± 0.5	8.5 ±0.5	7.0 ±0.5	20± 1
4.	S4	38.0±0.5	10.5±0.5	8.2±0.5	23± 1

Table: 15. StatusofgrowthofAbelmoschus esculentus on 6th June

S.No.	Treatment	Shoot Length (cm)	Length ofLeave (cm)	WidthofLeave (cm)	No.ofLeaves
1.	S1	23.4± 0.5	8.5± 0.5	7.0± 0.5	18± 1
2.	S2	42.5± 0.5	14.7±0.5	9.2± 0.5	30± 1
3.	S3	30.8 ± 0.5	9.3 ±0.5	7.1 ±0.5	21± 1
4.	S4	40.7±0.5	12.3±0.5	8.7±0.5	25± 1

Table: 16.Statusofgrowthof *Abelmoschus esculentus* on 11th June

S.No.	Treatment	Shoot Length (cm)	Length ofLeave (cm)	WidthofLeave (cm)	No.ofLeaves
1.	S1	24.6± 0.5	9.8± 0.5	7.5± 0.5	20± 1
2.	S2	43.5± 0.5	16.0±0.5	10.3± 0.5	32± 1
3.	S3	31.9 ± 0.5	10.5 ±0.5	7.8 ±0.5	25± 1
4.	S4	41.8±0.5	13.7±0.5	9.0±0.5	29± 1

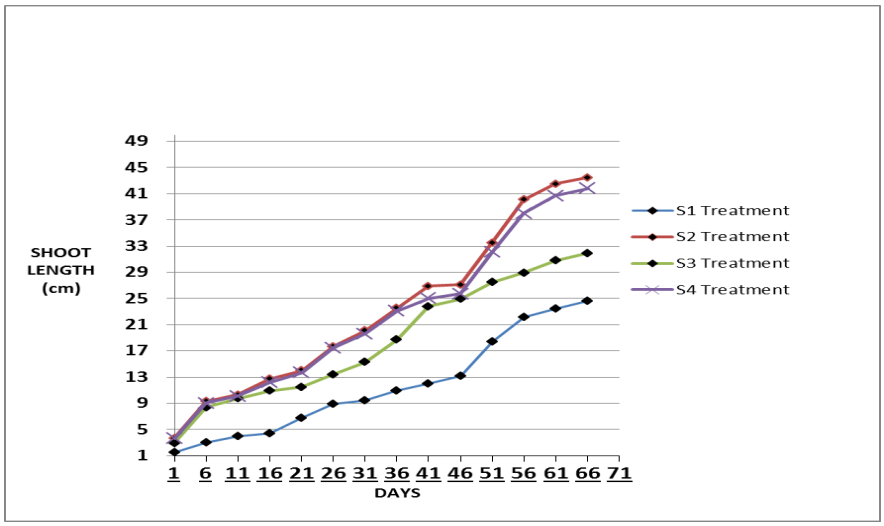

Fig No. 1: Graphical representation of Shoot Length data recorded during the entire study of *Abelmoschus esculentus.*

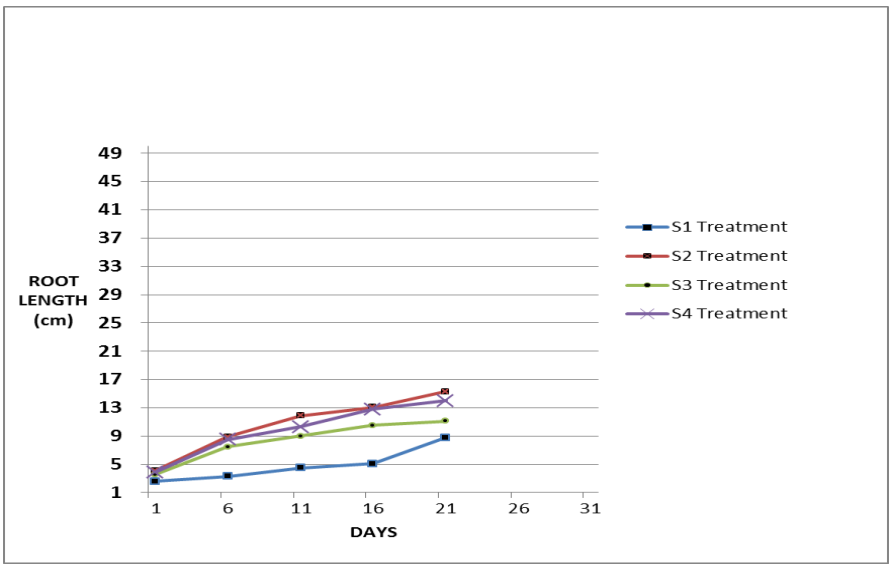

Fig No. 2: Graphical representation of Root Length data recorded during the entire study of *Abelmoschus esculentus.*

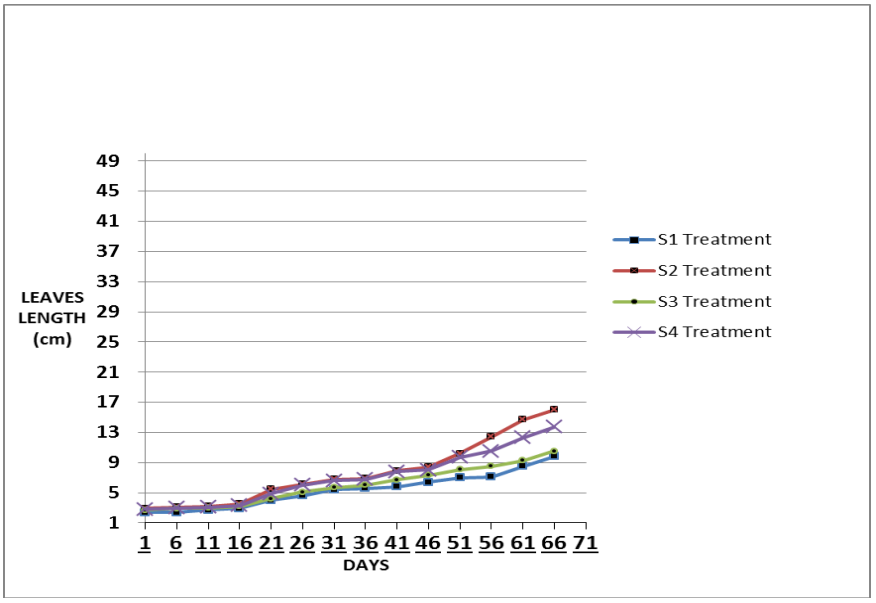

Fig No. 3: Graphical representation of Leaves Length data recorded during the entire study of *Abelmoschus esculentus*.

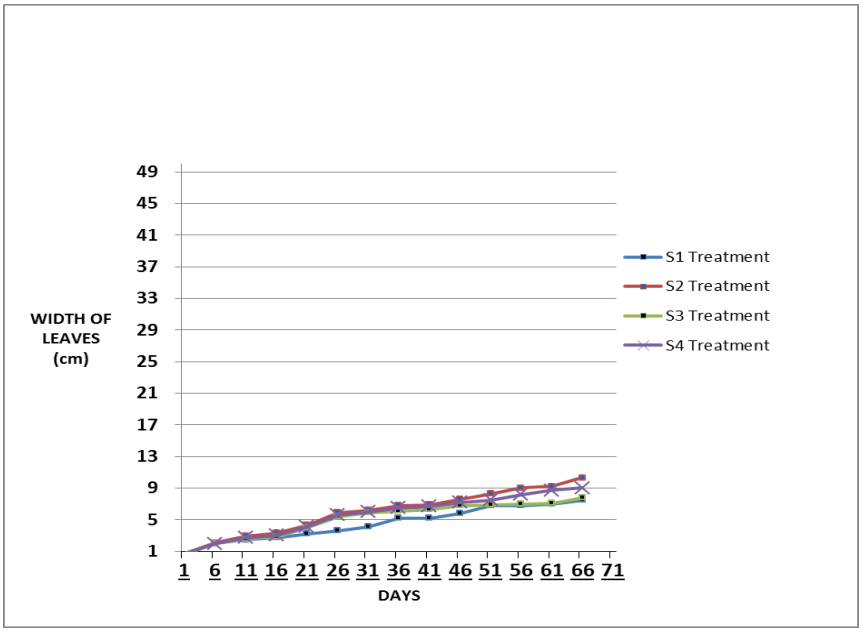

Fig No. 3: Graphical representation of Leaves width data recorded during the entire study of *Abelmoschus esculentus*.

The flowering was started on April, 19th2022 and plants in S4 treatment were for the very first time sprayed with 10 % solution of Country made liquor(original conc.36%v/v).The other growth parameters were observed as per schedule after treatment of S4 with CML. It was observed that S4 plants showed an increase in flowering number as counted from April, 19th2022 to April, 27th 2022. Flowering in this treatment is more as compared to treatment S2 Lady's fingers Control. The other parts of plant like shoot, leaves length, leave width and leaves number also showed a gradual increase in their size but the plant growth in this treatment is less as compared to treatment S2 Lady's fingers Control. The measurement of the Shoot length is 17.5cm±0.5cm, leaves length is 6.0cm±0.5cm, leaves width is 5.6cm±0.5 and the number of leaves is 9±1 on May, 2nd2022.

S1 treatment showed lesser growth than S2, S3 and S4 from April, 22nd2022 (Table no. 06). Shoot Length 4.4cm± 0.5,width of leaves 2.7cm±0.5 and length of leaves 2.9cm±0.5 and 8.9±0.5cm , 3.6cm±0.5cm and 4.6 cm±0.5cm respectively on May 2nd 2012 (Table no. 08) which was comparatively lesser than other three treatments. However, the flowering number in this treatment i.e.S1 was much higher as compared to other three treatments i.e. the maximum number of flowers from April, 19th2022 to April, 27th 2022.

S2 treatment showed of 12.3cm±0.5cm Shoot Length, 3.0cm±0.5cm width of leaves and 3.2cm±0.5cm length of leaves on April, 22nd 2022 (Table no. 06) which increased 17.7cm±0.5cm, 5.6cm±0.5cm and 6.1cm±0.5cm respectively on may, 2nd 2022 (Table no. 08).

S3 treatment showed of 11.9cm ±0.5cm shoot length, 2.8cm±0.5cm width of leaves and 3.2cm±0.5cm length of leaves on April, 22nd 2022 (Table no. 06) which increased 17.2cm±0.5cm, 5.6cm±0.5cm and 6.0cm±0.5cm respectively on may, 2nd 2022 (Table no. 08).

The other parameters which were measured are as follow
1. Number of flowers pertreatment.
2. Number of Fruits pertreatment.
3. Average weight of fruits perplant.

The details of flowering are discussed below: —
The flowering was observed since the first flower appeared and counted after every 02 days of interval from April, 19th 2022 to April, 27th 2022 in all the three S1, S2, S3 and S4 treatments as shown below in Tables.

Table no: 17.Status of flowering of *Abelmoschus esculentus* on 19th April 2022.

S. No.	Treatment	Flowers
1.	S1	56
2.	S2	23
3.	S3	27
4.	S4	34

Table no: 18.Status of flowering of *Abelmoschus esculentus* on 21th April 2022.

S. No.	Treatment	Flowers
1.	S1	97
2.	S2	54
3.	S3	61
4.	S4	72

Table no: 19.Status of flowering of *Abelmoschus esculentus* on 23th April 2022.

S. No.	Treatment	Flowers
1.	S1	169
2.	S2	95
3.	S3	101
4.	S4	112

Table no: 20.Status of flowering of *Abelmoschus esculentus* on 25th April 2022.

S. No.	Treatment	Flowers
1.	S1	252
2.	S2	125
3.	S3	137
4.	S4	195

Table no: 21.Status of flowering of *Abelmoschus esculentus* on 27th April 2022.

S. No.	Treatment	Flowers
1.	S1	293
2.	S2	158
3.	S3	161
4.	S4	217

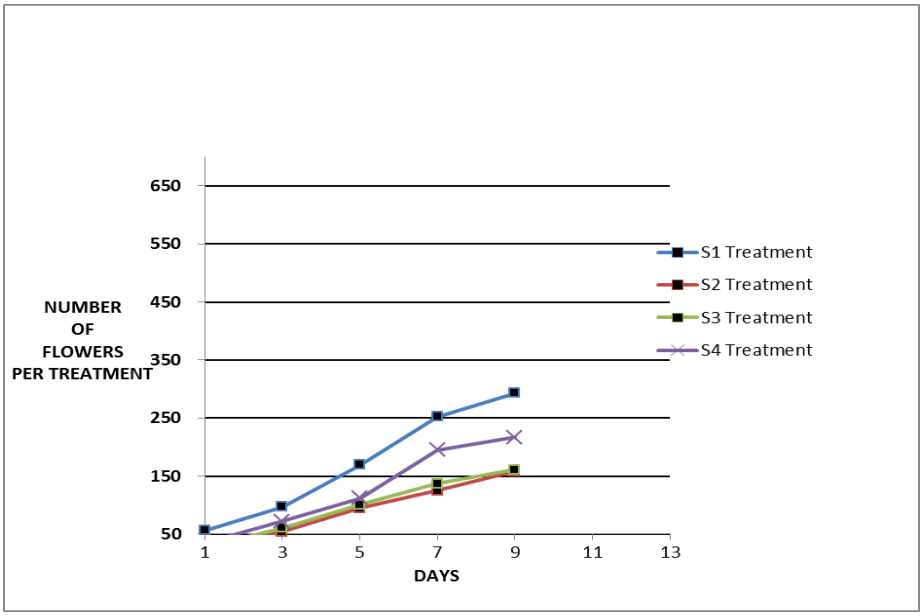

Fig No. 5: Graphical representation of Number of Flowers per Treatment data recorded during the entire study of this parameter of *Abelmoschus esculentus.*

The fruit was observed since the first fruit appeared and counted after every 04 days of interval from April 28th2022 to May 22nd2022 in all the three S1, S2, S3 and S4 treatments, as shown in Table no. 22 to 28.

Table no: 22.Status of fruits of *Abelmoschus esculentus* as on April 28th2022.

S. No.	**Treatment**	**Number of Fruits**
1.	S1	112
2.	S2	24
3.	S3	29
4.	S4	47

Table no: 23.Status of fruit of *Abelmoschus esculentus* as on May 2nd2022.

S. No.	**Treatment**	**Number of Fruits**
1.	S1	195
2.	S2	63
3.	S3	71
4.	S4	96

Table no: 24.Status of fruit of *Abelmoschus esculentus* as on May 6th2022.

S. No.	**Treatment**	**Number of Fruits**
1.	S1	286
2.	S2	81
3.	S3	90
4.	S4	105

Table no: 25.Status of fruit of *Abelmoschus esculentus* as on May 10th 2022.

S. No	**Treatment**	**Number of Fruits**
1	S1	322
2	S2	107
3	S3	112
4.	S4	167

Table No: 26.Status of fruit of *Abelmoschus esculentus* as on May 14th2022.

S. No.	Treatment	Number of Fruits
1	S1	376
2	S2	135
3	S3	140
4.	S4	189

Table no: 27.Status of fruit of *Abelmoschus esculentus* as on May 18th2022.

S. No.	Treatment	Number of Fruits
1	S1	411
2	S2	178
3	S3	159
4.	S4	258

Table no: 28.Status of fruits of *Abelmoschus esculentus* as on 22nd 2022.

S. No.	Treatment	Number of Fruits
1	S1	449
2	S2	220
3	S3	233
4.	S4	324

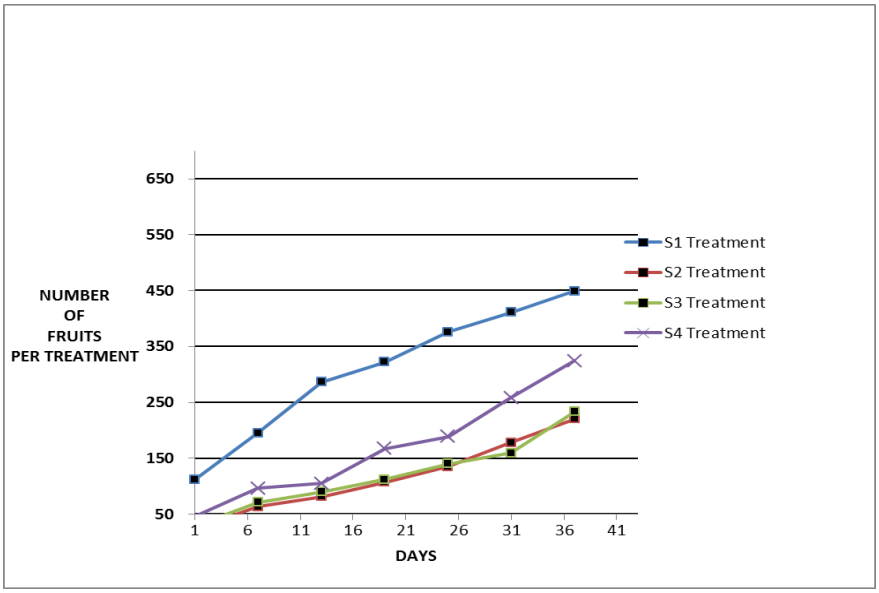

Fig No. 6: Graphical representation of Number of Fruits per Treatment data recorded during the entire study of Abelmoschus esculentus

Fruit weight per plant

After flowering in all the 4 treatments first fruit was observed on 28th April in S1 treatment. S1 treatment showed marked increase in number of fruits as compared to S2 while S3 and S4 showed greater number of fruits than S2 treatment but lesser than S1 treatment.

Table no: 29. Average Fruit weight per plant in S1, S2, S3 and S4 Treatments.

S. No.	Treatment	AverageFruitweightpe plant in(gm)
1	S1	1019.561gm
2	S2	73.37gm
3	S3	549.324gm
4	S4	617.203gm

Colony counting of microorganisms

The colony counting for the microorganisms were also performed with the serial dilution and the pour plate technique. The serial dilution was done by mixing of 10gm soil sample by 10 ml of distil water. The dilution steps were then performed .and pour plate technique was done using the medium. The microbes were allowed to grow on the PDA and nutrient agar medium for 24 -48 hrs. And then the growth of microbes was observed. Types of microbes were identified and counted.

PDA media
Potato dextrose agar (BAM Media M127) and potato dextrose broth are common microbiological growth media made from potato infusion, and dextrose. The most common media for cultivating fungus and bacteria that attack living plants or decomposing dead plant tissue is potato dextrose agar (abbreviated "PDA").

To make a potato infusion, boil 300 g (11 oz) sliced (clean but unpeeled) potatoes in 1 litre (0.22 imp gal; 0.26 US gal) water for 30 minutes before straining or pouring the broth via cheesecloth. Added distilled water to make the suspension a maximum capacity of 1 litre. The medium is autoclaved at 15 pounds per square inch (100 kPa) for 15 minutes after adding 20 grammes (0.71 oz) dextrose and 20 grammes (0.71 oz) agar powder.

Nutrient agar media
Nutrient agar is a microbiological medium for the growth that is often used for non-fastidious bacteria culture. It is helpful since it stays solid at even quite high temperatures. Bacteria cultivated in nutrient agar also spreads on the top and is apparent as tiny colonies. The bacteria thrives in the fluid of nutrient broth and emerges as a soupy material with no discernible clumps. Nutrient agar normally comprises (w/v).
0.5 % Peptone
0.3 % beef extract/yeastextract
1.5 %agar
0.5% NaCl
Distilledwater

PH adjusted to neutral (6.8) at 25 °C.
Nutrient broth is prepared in the same way, excluding the agar.

Colony counting
Colony counting is a method used to count the microorganisms in petri plate using a colony counter. A colony counter is a tool which tallies the bacterial colonies or even other microorganisms that emerge on an agar medium. Early counters were simply illuminated surfaces where the plate was put, with the colonies checked off with a felt-tipped pen on the outside surface of the plate whereas the operator manually kept the tally. More newer counters seek to digitally count the colonies by distinguishing particular patches of light and dark based on automated or user-set thresholds and tallying the resulting contrasting spots.

This procedure was done to see the growth of different types microorganisms like Bacteria, Fungi and Actinomycetes as they play an important role in the rhizoshphere of the plant, the reason was to find any affect due to treatment of the CML and it was observed that a marked effect on microorganisms occurred.

The tables are shown below after the treatment of the CMLs.

Colony Counting For okra (CML)

Date	25-03-2022				30-03-2022				04-04-2022			
Interval	0-5 days				5-10 days				10-15 days			
Treatment	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
Bacterial	3	43	39	41	8	40	48	49	12	45	30	33
Fungal	2	25	25	25	1	25	25	25	9	25	26	26

Date	09-04-2022				14-04-2022				19-04-2022			
Interval	15-20 days				20-25 days				25-30 days			
Treatment	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
Bacterial	16	40	31	35	18	40	35	36	13	55	38	40
Fungal	2	24	26	26	2	24	27	28	2	24	20	20

Date	24-04-2022				29-04-2022				04-05-2022			
Interval	30-35 days				35-40 days				40-45 days			
Treatment	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
Bacterial	14	42	40	40	16	40	41	43	12	45	40	40
Fungal	3	26	23	24	4	20	18	18	3	22	12	14

Date	09-05-2022				14-05-2022				19-05-2022			
Interval	45-50 days				50-55 days				55-60 days			
Treatment	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
Bacterial	1	38	40	42	2	42	45	46	1	42	35	38
Fungal	0	24	16	16	0	18	15	20	1	24	20	22

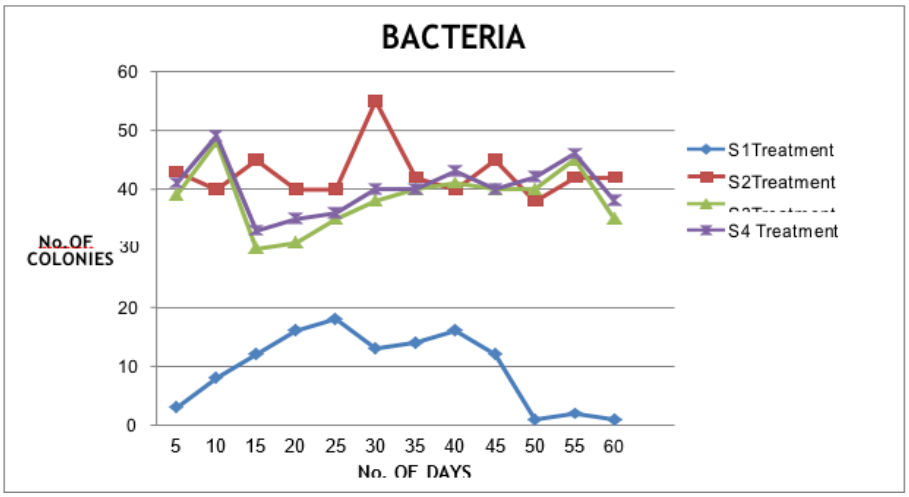

Fig No. 7: Graphical representation of microbial analysis of soil samples of all the treatments for Bacterial growth during the entire study of *Abelmoschus esculentus*

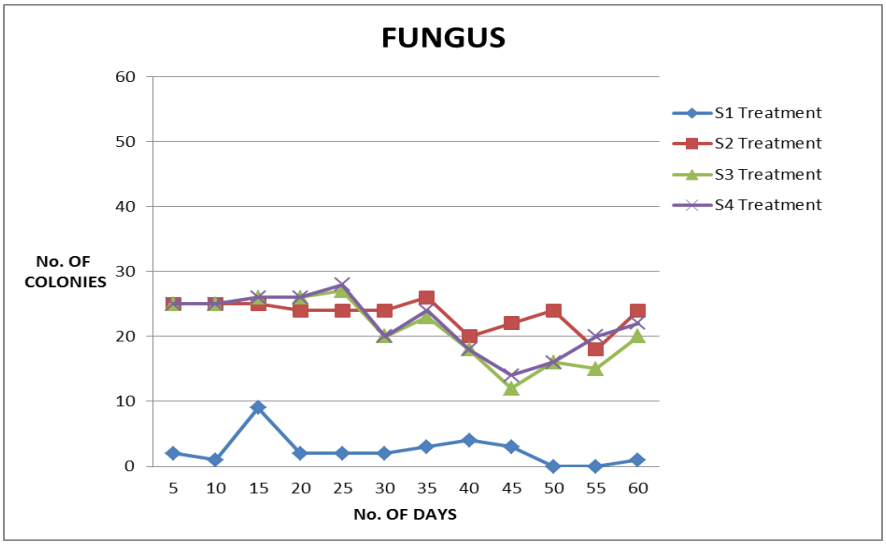

Fig No. 8: Graphical representation of microbial analysis of soil samples of all the treatments for Fungal growth during the entire study of *Abelmoschusesculentus.*

Result and Discussion

Germination study

The germination was influenced by treatment with Country made Liquor. Result showed that in S1 treatment maximum number of seedling appears, that was sprayed with 10% solution of CML in contrast to S2, S3 and S4.

Growth study

Plant Height:S2 treatment records maximum plant height, in comparison to S1, S3 and S4. There was no significance difference was observed in this parameter in S2, S3 and S4 treatments till the time of flowering but after that it was observed that the plant height in S3 and S4 showed less growth as compared to S2. S1 treatment showed the minimum plant height as compared to other three treatments i.e.S2, S3 and S4.

Number of leaves per Plant:S2 records highest number of leaves, around <35 leaves per plant, in treatment S1 the amountof leaves per plant is <22, in treatment S3 the number of leaves per plant is <25 and in treatment S4 the amount of leaves per plant is <29 (At 27 days after sowing). The number of leaves in all four treatments is same till the time of flowering but after the spray of CML in S3 (at the time of germination) and in S4 (at the time of flowering) the number of leaves in S3 and S4 become less as compare to S2.

Length & Width of Leaves per Plant: Leaf length and breadth were evaluated in all treatments till 27 days following seed planting. S2 treatment has much longer and wider green active leaves than S1, S3, and S4. This factor had the same impact as the other two factors i.e. plant height and number of leaves per plant; no substantial change was seen in S1, S3, and S4 till blooming.

But after the spray of CML on S3 and S4 the leaves length and width showed less increase in growth as compared to S1.

Root Length: Five plants from each treatment were chosen at random to evaluate root length, which was already utilised for other growth parameters. The root length in the S2, S3, and S4 treatments was the same and was greater than in the S1 treatment.

Flowering: S1 treatment produces more blooms at 45 days after sowing than S2, S3, and S4. S2treatment showed the less number of flowers as compared to other three treatments i.e. S1, S3 and S4.

Number of fruits: The fruit number is high in treatment S1 as compared to other three treatments S2, S3 and S4. The number fruits from four treatments S1, S2, S3 and S4 are shown in tables 22 to 28.

Other Observation: It is been observed that plants of treatment S1 okra + CML shows the Water stress resistance as compared to other three treatments i.e.S2, S3 and S4. The leaves of the plants of treatment S1 doesn't shows the wilting effect under water stress but the plants of other two treatments shows the wilting when they came under the water stress. The difference between the shelf life in the fruits from these four treatments was also observed. It was seen that the shelf life of the fruits from treatment S1 is much high as compared to the fruits of other three treatments i.e.S2, S3 and S4. Under the normal room temperature and condition fruits from S1 treatment showed good, shelf life as compared to the fruits from other three treatments S2, S3 and S4.

Conflicts of interest

The authors declare no competing interests.

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References

1. Muhammad Irfan Ali, , Muhammad Aslam Khan, Abdul Rashid Muhammad Ehetisham-ul-haq, Muhammad Talha Javed, Muhammad Study on Epidermiology of Okra Yellow Vein Mosaic Virus (OYVMV) and its management through Tracer, Myocotal and Imidacloprid. Email: plant.uaf@gmail.comReceived September 15th, 2012; revised October 17th, 2012; accepted November 20th, 2012.
1. M. QASIM KHAN, M. WASEEM ABBASI, M. JAVED ZAKI AND SHAKEEL AHMED KHAN, 2012. Study on evaluation of Bacillus thuringiensisisolates against root-knot nematodes following seed application in okra.
2. Mohsen A. Hashem. Study on adsorption of lead ions from aqueous solution by okra wastes. Departement of Chemical Engineering, Faculty of Engineering, El-Minia University, El-Minia, Egypt.
3. Sanjeev Sharma and Kapil Sharma, 2010. Study on Seed Germination and Growth Behaviour of Brinjal (Solanum Melongena) var.BR 112 in Admiration to Effect of CML. (Country Made Liquor). Journal of sciencepub.net nature and sciences ns0805-163-166.
4. Seema Dwivedi, Sanjeev Sharma, Kapil Sharma and Kunwarvir Singh 2012. Study on Seed Germination and Growth Behaviour of Brinjal (Solanum Melongena) var.BR 112 in Admiration to Effect of CML. (Country Made Liquor). Journal of Chemical, Biological and Physical Sciences An International Peer Review E-3 Journal of Sciences: e- ISSN: 2249 –1929
5. Bajaj K. L, Kaur G, and Chadha M. L, 1979. Glycoalkaloid content and other chemical constituents of the fruits of some eggplant (Solanum melongena L.) varieties. Journal of Plant Foods 3(3): 163- 168.
6. Bajaj K. L, Kaur G, Chadha M. L and Singh, B. P. (1981). Polyphenol oxidase and other chemical constituents in fruits of eggplant (S. melongena L) varieties. Vegetable Sciences, 8: 37-44.
7. Bajaj K.L and Mahajan R. (1980). Effects of nematicides on the chemical composition of the fruits of egg-plant (Solanum melongena L.) Qual Plant Plant Foods Hum Nutr 30:69- 72 (1980) 0377- 3205/80/0301-0069 ¢0.60. 0 1980 Dr. W. Junk by Publishers, The Hague. Netherlands.
8. Akanbi B.W., TogunO.A.,Olaniran A.O.,AkinfasoyeO.J.,andTairu M.F. Physico-Chemical Properties of Egg Plant (Solanum melongena L.) Fruit in Response to Nitrogen Fertilizer and Fruit Size. Agricultural Journal 2 (1):140-148, 2007. © Me dwell Journals, 2007.
9. Murugesan A. G., Jeyasanthi T. and Maheswari S. Isolation and characterization of cypermethrin utilizing bacteria from Brinjal cultivated soil, African Journal of Microbiology Research Vol. 4 (1), pp. 010-013, 4 January 2012.
10. Biswas, T. D. & S. K. Mukherjee, Textbook of soil Science (Second edd.) (1994). Tata McGraw-Hill Publishing Company Ltd. New Delhi.
11. Hartmann, H. T., D. E. Kester, F.T. Jr. davis& R. L. Genève, Plant propagation, principle & practices, (six edd.) (1992).Handbook for Seedling Evaluation, published by, International seed Testing Association (ISTA), Zurich, Switzerland.
12. Seed Research, (December, 2003). A Journal devoted to the cause of seed science, Indian Society of Seed Technology, Indian Agricultural Research Institute (IARI), New Delhi.
13. Agrawal, R. R., Soil Fertility in India (1967). Asia publishing House, New Delhi.

14. Singh, S. P, Production Technology of Vegetable crops, (1989).Agricultural Res. Comm. Centre, Karnal.
15. Tandon, H. L. S., Fertilizer management in food crops, (1993).Fertilizers Development and Consultation Organization, New Delhi.
16. Black, C. A., Soil- plant relationship (1957). New York, Johan Willy and sons. Inc., New York.
17. Dutt, A. K., Manures and Fertilizers, (1966). Handbook of Agriculture (ICAR), New Delhi.
18. Sharma, P. D., Ecology and Environment (Seventh Edd.) (2003), Rastogi Publication, Meerut, India. 20. Bajaj K. L, Kaur G, and Chadha M. L, 1979. Glycoalkaloid content and other chemical constituents of the fruits of some eggplant (Solanum melongena L.) varieties. Journal of Plant Foods 3(3): 163-168.Research Vol. 4 (1), pp. 010-013, 4 January 2012.