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"Comparative Study on the Impact of Country Made Liquor (CML) On Growth and Productivity of Brinjal (*Solanum Melongena* L VAR. BR112.) And OKRA (*Abelmoschus Esculentus*) And Its Impact on Microenvironment of Treated Plants"

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ABSTRACT:
A comparative study is being done to examine the impact of CML on Okra and Brinjal. We have looked at how CML affects the soil microenvironment, plant growth, and productive behaviour. The Times of India reported on a study that served as the study's basis. The NCR Gurgaon farmers produced the CML in order to cultivate the brinjal harvest. According to reports, the application of CML raised brinjal production six or eight times. The resulting brinjal was said to be of excellent quality and beauty. Previously, brinjal (Solanum melongena Var BR112) was studied for productivity and growth behaviour. Our study's foundation is the questionnaire that farmers in the National Capital Region who produced crops utilising CML. They combined CML. with gibberellic acid. The crop's yield has increased because of this combination. We employed CML. as a solvent. They claimed that the treatment improved the flavour of the okra (Abelomoschus esculentus L.) and brinjal (Solanum melongena L.) in some way. Prior to this, an experiment was carried out with okra to investigate the impact of CML on its growth and production. Brinjal (Solanum melongena VAR BR112), was studied for its productivity and growth behaviour under field conditions. Analysis of the soil microflora under various treatments is another aspect of the study. A comparative examination of the microclimate of the soil and the crops will be compiled in this paper. The study reveals that Brinjal showed a stronger response to CML in terms of growth and productive behaviour than Okra did.

Introduction

Food and water are essential components of life; without them, no one could exist. Because they are essential sources of nutrients like vitamins, proteins, dietary fibre, and carbs, fruits and vegetables serve a significant role in our diet. Consuming an abundance of fruits and vegetables helps lower your risk of heart disease, high blood pressure and certain types of cancer, among other illnesses. However, eating tainted fruits and vegetables can present serious health dangers rather than health benefits. It is common knowledge that bacteria-induced contamination of fruits and vegetables, weedicides, and pesticides not only endanger human health but also the environment.

Humans who consume a lot of vegetables have a lower chance of developing cardiovascular disease (Mullie and Clarys, 2011). Low vegetable intake is thought to contribute to roughly 31% of ischemic cardiovascular diseases and 11% of strokes globally in imbalanced diets. Unbalanced diets with little intake of vegetables, complex carbohydrates, and dietary fibre are thought to be one of the top 10 risk factors for mortality, contributing to an estimated 2.7 million deaths annually, according to the 2007 World Health Report (Dias, 2011

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and 2012). Increased awareness of the health benefits of diets that include vegetables, combined with an expanding selection of vegetables available for consumption, and has encouraged increased consumption of vegetables in many parts of the world. Consumption of vegetables is also increasing, which is a result of consumers' rising incomes, desire for variety and understanding of the health advantages of vegetables. Consumers are becoming increasingly concerned about product safety issues at the same time. The promotion of nutritious vegetable products has corresponded with a rise in consumer interest in the food's ability to promote health.

Solanum melongena L., sometimes known as brinjal or aubergine, is a warm-weather crop that is widely grown throughout the world in tropical and subtropical areas. After the potato, tomato, pepper and tobacco, it is the fifth most commercially significant solanaceous crop in the world. It follows tomato, potato, and onion as the fourth most produced vegetable in India. Due to its high levels of protein, numerous vitamins and minerals, including iron, calcium, potassium, and magnesium, dietary fibre and many bioactive phytochemicals that are beneficial for body growth, brinjal is ranked among the top ten vegetables while having a relatively low calorie value (Hazra, 2023). Anticancer, anti-inflammatory, antioxidant, and antiviral characteristics of brinjal are among its therapeutic benefits (Fekry et al., 2019; Jin et al., 2020; Khazaei et al., 2020).

The fruit of *Abelmoschus esculentus*, a member of the Malvaceae family, is commonly referred to as okra. Okra is a crop that originated in Ethiopia and spread around the world, including to the Mediterranean, North Africa, Arabia and India (Gemede et al., 2015). Okra is a vegetable that may be consumed raw or cooked, and it can be added to stews, soups, and salads (Wankhade et al., 2013). The fruit of the okra plant is very juicy, full of nutrition, and an excellent provider of minerals and vitamins. The primary form of carbohydrates in okra is mucilage (Singh et al., 2014), which is frequently used in a variety of industrial sectors and for therapeutic purposes (Bencharsi, 2012). Due to its potential as a functional food, it is frequently used in cooking as well as traditional medicine to treat worms, diarrhoea, inflammation and irritability of the stomach, intestines and kidneys.

Nutronal Composition of Brinjal and Okra

Table- 1 Ingredients of the Brinjal's edible component per 100g			
Nutritional Components (g)			
Fibre	3.0	Protein	0.98
Energy	25.0	Carbohydrates	5.88
Sugar	3.53	Fat	0.18
Water	92.3		
Vitamins and Minerals (mg)			
Calcium	9.0	Vitamin C	2.20
Iron	0.23	Thiamin	0.039
Potassium	229.0	Vitamin B6	0.084
Magnesium	14.0	Riboflavin	0.037
Zinc	0.16	Niacin	0.649
Sodium	2.00	Vitamin E	0.30
Phosphorus	24.0	Vitamin K	3.50µg
Folate	22.0µg	Vitamin A IU	23

Table- 2 Ingredients of the okra's edible component per 100g			
Nutritional Components (g)			
Fibre	1.2	Protein	1.9
Moisture	89.6	Carbohydrates	6.4

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Calories	35.0	Fat	0.2
Minerals	0.7		
Vitamins and Minerals (mg)			
Calcium	66.0	Vitamin C	13.10
Copper	0.19	Thiamine	0.07
Potassium	103.0	Magnesium	53.0
Oxalic Acid	8.0	Riboflavin	0.01
Nicotinic Acid	0.06	Iron	0.35
Sodium	6.9	Sulphur	30.0
Phosphorus	56.0		

Soil Microflora

Interactions between above-ground and below-ground biota have an impact on the organisation of microbial communities and ecological processes. For the purpose of establishing a sound agricultural practise, there is a pressing requirement for rigorous monitoring of the microbes' feedback on the soil micro-ecosystem. Numerous soil characteristics can affect the structure of the microbial community, according to recent studies. One of the most significant living species in agriculture is the microbe, and shifting climatic conditions have a significant impact on microbial diversity. Changes in soil moisture, vegetation types, soil response, soil organic matter, etc. all have a significant impact on soil microbial diversity. Microorganisms (bacteria, fungus, and archaea), the largest category of organisms found in soil in terms of numbers and biomass, are included in the vast diversity of organisms that make up the soil biota (Fao, 2022). For example, microorganisms perform the ecological activities of N2-fixation, ammonia-oxidation, denitrification and ammonification (Mercado-Blanco et al., 2018). Soil microbial communities play essential roles in ecosystem operations and regulate crucial processes, such as the carbon and nitrogen cycles. Additionally, microbial communities play a significant role in the breakdown of several substances, including organic pollutants like pesticides (Barra Caracciolo and Grenni, 2021), and they support plant development and disease prevention.

Material and Methods

An experiment was conducted to see how CML affected the growth of brinjal and okra. Germination and plant growth behaviour, or the length of the plant, the number of leaves per plant, and the length and breadth of each leaf, were plant characteristics that were taken into consideration for the understudy.

The purpose of the experiment was to ascertain how CML affected the germination of brinjal and lady finger seeds and their growth. The following therapies were used in the research:

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

Total number of seeds used for the experiment: 2000
Number of seeds used in each treatment: 500

In S1, the country-made liquor had been applied on the day of seed sowing and every three days thereafter; in S3, the CML was sprayed just during germination; and in S4, the CML was sprayed only during flowering. Liquor manufactured in the nation was not used in the S2 treatment. At intervals of five days following seeding, the total number of germinated plants from each treatment was counted, and the results were presented as an emergence count. Different parameters, such as shoot length, leaf number, leaf length and width, and root length, were taken into consideration when observing plant growth. At the conclusion of the germination count, five normal seedlings were chosen at random to be studied for shoot length, number of leaves, and length and width of leaves. All of these characteristics were measured in centimetres. In order to measure root length—which was previously used to measure another growth parameter—five plants from each treatment were chosen at random, and the mean values were determined at various stages of growth.

COLONY COUNTING OF MICRO ORGANISMS

Additionally, the pour plate method and serial dilution were used to count the microorganism colonies. A 10-gramme soil sample was mixed with 10-millilitres of distilled water to perform the serial dilution. Next, the dilution processes were carried out and use the pour-plate technique with the media. After being let to grow on the PDA and nutrient agar medium for 24 to 48 hours, the bacteria's growth was noticed. Microbe types were recognised and tallied.

PDA MEDIA

Common microbiological growth media consisting of potato infusion and dextrose include potato dextrose agar (BAM Media M127) and potato dextrose broth. The most popular medium for cultivating fungi and bacteria that attack living plants or decompose dead plant tissue is potato dextrose agar, or "PDA".

Colony counting

Using a colony counter, colony counting is a technique for counting the microorganisms on a Petri plate. The tool used to count colonies of bacteria or other microorganisms growing on an agar plate is called a colony counter. In the beginning, counters were only illuminated surfaces where plates were put. The operator would manually keep count while marking off the colonies on the plate's outside surface with a felt-tipped pen. In an effort to electronically count the colonies, more contemporary counters recognize distinct areas of light and dark based on criteria that can be selected by the user or automatically calculated, then count the contrasting spots that result.

This procedure was carried out to observe the growth of various microorganisms, including fungi, bacteria, and actinomycetes, which are important to the plant's rhizosphere. The aim of the procedure was to determine whether the treatment of CML had any effect on these microorganisms, and it was found that there was a noticeable effect.

Observations

Table- 3 Germination count of Brinjal and Okra

Brinjal (*Solanum melongana*)		Okra (*Abelmoschus esculentus*)	
Treatment	Germination Count	Treatment	Germination Count
S1	475	S1	500
S2	400	S2	385

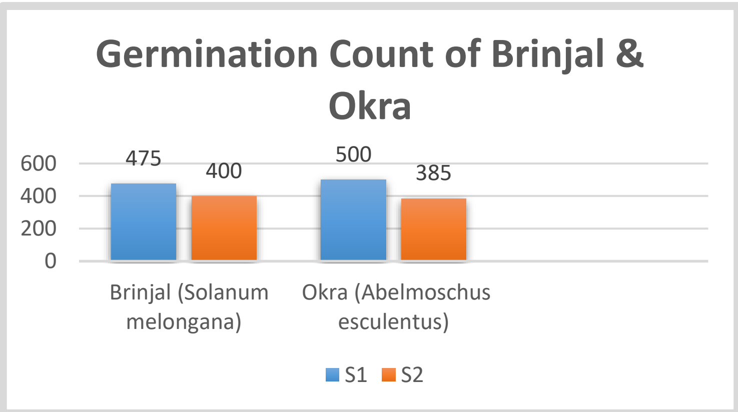

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Table-4 Growth Status of Okra and Brinjal

Treatment	Shoot Length (cm)		Length of Leaves(cm)		Width of Leaves (cm)		No. of Leaves	
	Okra	Brinjal	Okra	Brinjal	Okra	Brinjal	Okra	Brinjal
S1	24.6±0.5	75.5±0.5	9.8±0.5	23.0±0.5	7.5±0.5	15.0±0.5	20±1	82.0±1
S2	43.5±0.5	45.5±0.5	16.0±0.5	16.5±0.5	10.3±0.5	11.3±0.2	32±1	59.0±1
S3	31.9±0.5	53.0±0.5	10.5±0.5	17.0±0.5	7.8±0.5	11.4±0.1	25±1	71.0±1
S4	41.9±0.5	74.5±0.5	13.7±0.5	22.8±0.5	9.0±0.5	14.0±0.1	29±1	90.0±0.1

Table- 5 Total number of Flowers

Treatments	Okra	Brinjal
S1	293	155
S2	158	90
S3	161	133
S4	217	152

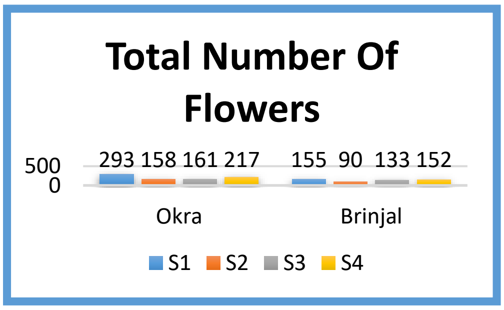


Table- 6 Total Number of Fruits

Treatments	Okra	Brinjal
S1	449	180
S2	220	95
S3	233	175
S4	324	190

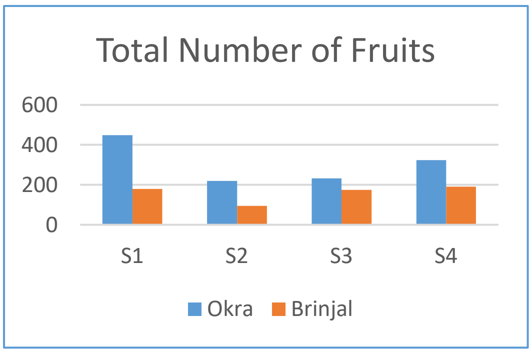
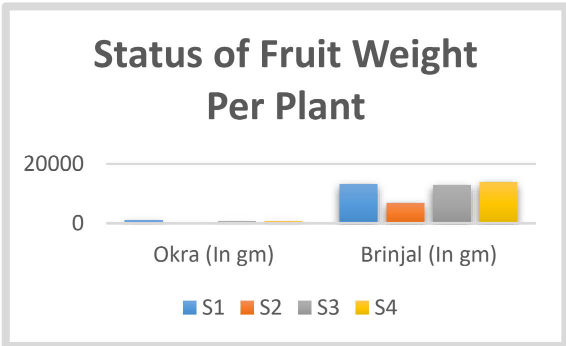


Table- 7 Status of Fruit Weight per plant

Treatments	Okra	Brinjal
S1	1019.561gm	13200gm
S2	73.37gm	6800gm
S3	549.324gm	12800gm
S4	617.20gm	13800gm



Result and Discussion

After five days of seeding and up to twenty days, the seeds began to germinate. In both crops, the S1 treatment exhibits a greater emergence count than the S2 treatment. In the S1 treatment, 100% germination was attained in okra, but only 95% in brinjal (Table-3). S1 treatment in okra exhibited slower development than S2, S3, and S4 treatments. Nonetheless, S2 and S4's growth states are not all that different from one another. Brinjal's growth status peaked after the S1 therapy and decreased during the S2 treatment. Table 4 makes it quite evident that CML promotes plant development (Table-4).Compared to S2, the S1 and S4 treatments showed a significant increase in the quantity of flowers. For both plants, the maximum flowering peak was found in S1, and the lowest in S2 (Table-5).In Okra the maximum fruiting happens in S1 than in S4, S3 and S2. Whereas in brinjal S4 exceeds all the other treatments in fruiting stage. S2 shows the least fruiting in both the plants (Table-6).When compared to the control, the fruit weight of both plants is much higher in the CML treatments. In okra, S1 surpasses the resting treatment, but in brinjal, S4 has the maximum fruit weight. S2 has the lowest fruit weight of both plants (Table-7).

According to the findings, C.M.L. and alcohol had an impact on all areas of Brinjal and Okra's growth and productivity. It is predictable from the study, alcohol has a good effect on the Brinjal and Okra growth and productivity promoting hormones, such as auxins and gibberellic acid. At the same time, substantial equivalency had not revealed any significant difference in the composition of case and control fruits for oil, proteins, moisture, ash, and carbs.

Micro flora study revealed an increase in Tichoderma viridae, a well-known plant defender, and Arbuscular Mycorrhizal Fungi such as Gigaspora gigantea and Glomus sinuosum, both of which are powerful alcohol users. Saccharomyces cerevisiae in combination with a free-living nitrogen fixer Azotobacter vinelandii and organic matter degraders such as Bacillus megaterium and Bacillus Licheniformis have increased, while Alternaria sp., Pseudomonas fluorescens, and Escherichia coli have decreased.

Conclusion and Future Perspectives

It can be concluded from the study that CML positively influences the growth and productivity of Brinjal and okra. Work on microflora, on the other hand, strongly indicated the intervention of C.M.L. and alcohol in modifying soil microbial dynamics. It can be utilised to selectively promote specific bacteria by fine-tuning alcohol concentrations to control microbial population for enhancing crop output. Also, studying the crop at the molecular level to determine its biochemical route will be highly beneficial to the agricultural industry in terms of increasing crop quality and quantity.

Conflicts of Interest

The authors declare no competing interests.

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No

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