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# Allelopathic Effect of Syzygium Cumini and Mangifera Indica on Seed Germination

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**Abstract: The current investigation anticipated that allelopathic influence of *M. indica and S. cumini* on the germination and primary growth of wheat (*Triticum aestivium*), Jowar (*Sorghum bicolor),* and Mung (*Vigna radiata*) seeds. *M. indica* and *S. cumini* concentrated leaf leachate enhances germination percentage in Jowar, Wheat, and Mung seeds, while average root shoot length increases at a 1:5 concentration. The investigation concluded that M. indica and S. cumini leaves can be used as green manure for these crop plants, and thAt cultivating these plants around the farmyard can also benefit them.**

***Keywords:*** *Allelopathy, Leachate, Mangifera Indica, Syzygium Cumini, Triticum Aestivium, Sorghum Bicolor, Vigna Radiate Etc.*

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## I. INTRODUCTION

Allelopathy is a new branch of Science. The term Allelopathy was coined by Molisch (1937) from two Greek words *Allelo-* and *-Pathy* (meaning "mutual harm" or "suffering"), i.e. injurious effect of one upon another (Willis and Rick 2007). Allelopathy refers to beneficial or harmful effect of one plant on another plant both crop and weeds species from release of biochemical known as allelochemical from plant parts leaching root exudation; Voladisation, residue decomposition on other process in both natural and Agriculture system. Allelochemicals have beneficial or harmful effects on the target organisms and community (Mali and Kanade, 2014).

Allelopathy is a phenomenon in which plants release some chemicals into the surrounding environment through several ways, such as volatilization, leaching from leaves, exudation from roots, and decomposition of plant residue, and these chemicals cause growth inhibitory or stimulatory effects on other plants and/or microorganisms. (Rice 1984). Allelopathic plant create adverse condition to their neighboring plant reducing their seed germination and seedling growth.

Mangifera belongs to the family of Anacardiaceae. Plants produce hundreds of secondary metabolites, some of which exhibit allelopathic action. Some plants showed outstanding weed control ability in intercropping and/or as soil additions due to their allelopathy (Caamal-Maldonado 2001). Allelopathic compounds are transferred into nearby environments through volatilization, root exudation, leaching, and plant decomposition, and they can hinder the germination and growth of neighboring plants. (Field,Jordán, & Osboourn, 2006). Several phenolic compounds were identified in the extracts of mango leaves as allelopathic active substances.such as ferulic, coumaric, benzoic, vanillic, chlorogenic,caffeic, gallic, hydroxybenzoic, and cinnamic acids El-Rokiek et al., 2010) M. Indica belongs to the family Anacardiaceae, which encompasses around 70 different species. All mango cultivars belong to the same species of M. indica. (Mukherjee, 1972) The interaction between mango and weeds or crops in home gardens has been studied in terms of allelopathy, and evidence of allelopathy has accumulated in the literature for over two decades (Kato-Noguchi and Kurniadie 2020).

S. cumini is a medicinal plant that originated in India and Indonesia. The Jamun tree is a tropical evergreen blooming plant in the Myrtaceae family. It is cultivated for its fruit, lumber, and ornamental value. It is well-known for its numerous medicinal and nutritional benefits. Plants produce a variety of secondary metabolites, or unprocessed byproducts, including bioactive compounds. Jamun fruit extract has been used to treat a range of illnesses and ailments, and it also contains anti-diabetic qualities (Singh *etal.,* 2019). The current investigation anticipated that allelopathic influence of *M. indica and S. cumini* on the germination and primary growth of wheat (*Triticum aestivium*), Jowar (*Sorghum bicolor),* and Mung (*Vigna radiata*) seeds. *M. indica* and *S. cumini* concentrated leaf leachate enhances germination percentage in Jowar, Wheat, and Mung seeds.

## II. MATERIAL AND METHOD

- *Procurement of Leaf Litter and Seeds:*

Leaf litter of *M. indica* and *S. cumini* obtained from surrounding area of village Varange of Kolhapur. The leaf

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litter was preserved in polythene bags and stored in dry conditions seeds of *Sorghum bicolor* (Maldandi), *Triticum aestivum* (HD 2189) and *Vigna radiata* (local variety) all the seeds obtained from local market.

➢ *Preparation of Leaf Leachate:*

A method described by of Koul and Singh (1989) and Jadhav and Gaynar (1992) was followed for preparation of leaf leachate 200gm of dried leaves were weighed washed with tap water and soaked in 1 liter of sterile distilled water for 24 hours at room temperature. After 24-hour leachate was filtered through Whatman No 1 filter paper and filtrate was used for further studies. The leaf leachate was stored for some period in deep freeze.

➢ *Germination Studies:*

Healthy seeds of Jowar, Wheat, Mung were surface dried by treating with Mercury chloride for 5 min. Then seeds were rinsed with distilled water for 4-5 times. 10 seeds of Jowar, Wheat, Mung were placed in sterilized petriplate with moistened filter paper 5ml of leachate was added in each petriplate supplied with 5ml distilled water served as control seeds were allowed to germinate at room temperature under laboratory condition and used for further analysis (Chung and Miller 1995).

➢ *Germination and Seedling Growth:*

The germination percentage was recorded after 24, 48, 72 hours. The emergence of radical was considered as a criterion for germination. The photograph of one most vigorous seedling from treatment and corresponding control was taken.

After 120 hours of germination seeds from each petriplate control as well as treated were carefully removed blotted to dry and their fresh weight was recorded.

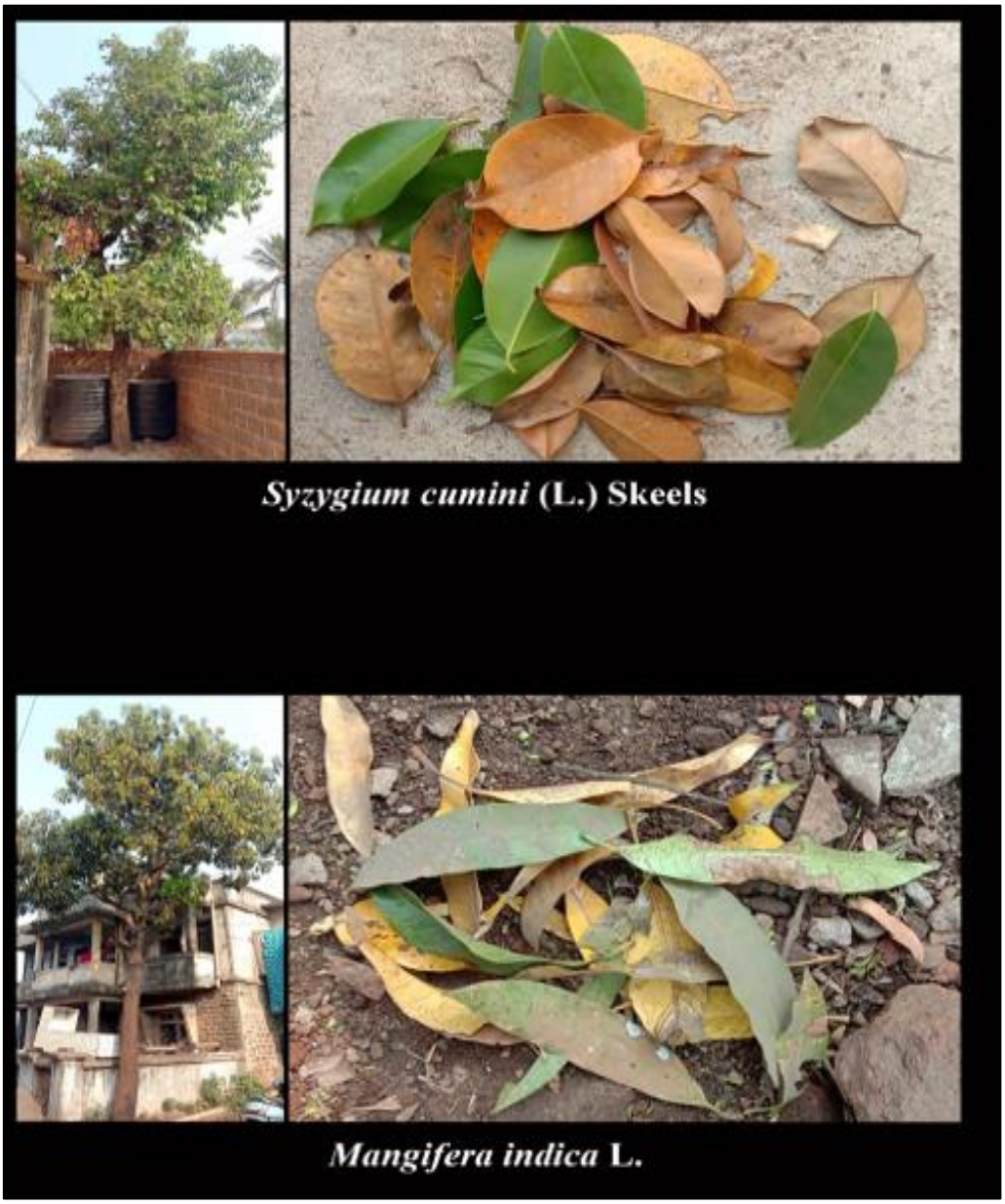


Fig 1 Procurement of Leaf Litter

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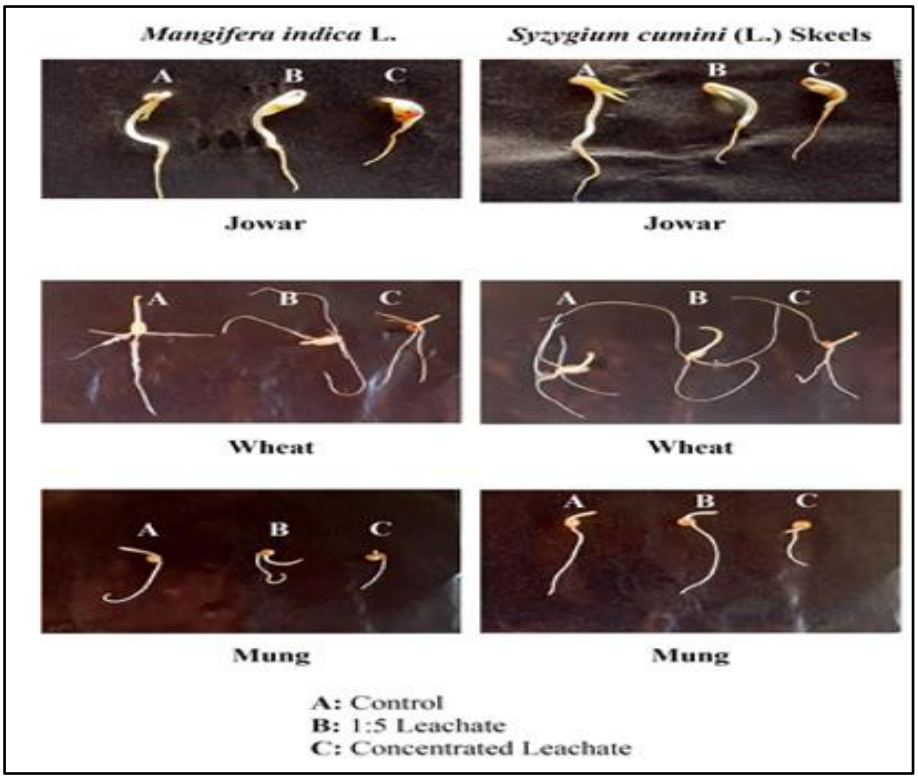


Fig 2 Effect of Leaf Leachate on Seed Germination

Table 1 Effect of *S. Cumini* Leaf Leachate on Seed Germination % of Different Crop Seeds.

| Sr.No. | Seed treated | Treatment | Germination % | | |
|---|---|---|---|---|---|
| | | | 24 Hours | 48 Hours | 72 Hours |
| **1** | **Jowar** | Control | 50 | 80 | 80 |
| | | 1:5 Leaf leachate | 40 | 70 | 80 |
| | | Conc. leachate | 30 | 80 | 100 |
| **2** | **Wheat** | Control | 100 | 100 | 100 |
| | | 1:5 Leaf leachate | 100 | 100 | 100 |
| | | Conc. leachate | 80 | 80 | 80 |
| **3** | **Mung** | Control | 90 | 90 | 90 |
| | | 1:5 Leaf leachate | 90 | 90 | 90 |
| | | Conc. leachate | 90 | 100 | 100 |

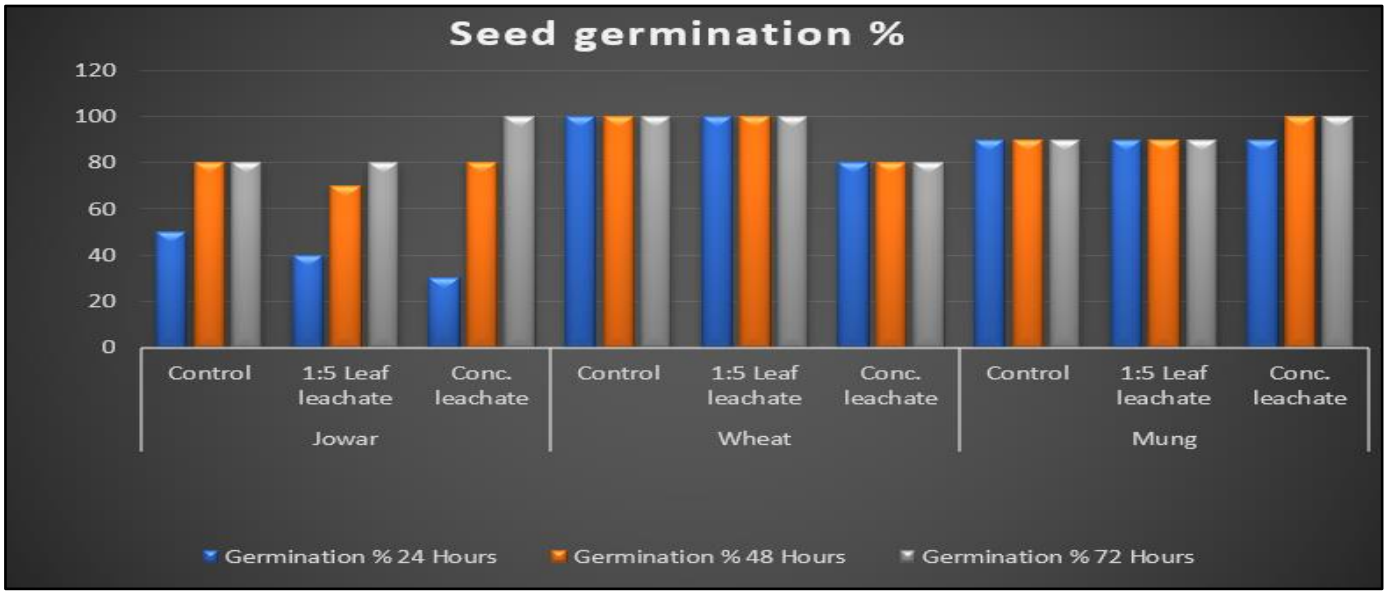


Fig 3 Effect of *S. Cumini* Leaf Leachate on Seed Germination % of Different Crop Seeds.

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Table 2 Effect of *M. Indica* leaf Leachate on Seed Germination % of Different Crop Seeds.

| Sr. No. | Seed treated | Treatment | Germination % | | |
|---|---|---|---|---|---|
| | | | 24 Hours | 48 Hours | 72 Hours |
| **1** | **Jowar** | Control | 80 | 80 | 80 |
| | | 1:5 Leaf leachate | 60 | 80 | 90 |
| | | Conc. leachate | 30 | 90 | 90 |
| **2** | **Wheat** | Control | 70 | 80 | 80 |
| | | 1:5 Leaf leachate | 100 | 100 | 100 |
| | | Conc. leachate | 80 | 90 | 90 |
| **3** | **Mung** | Control | 100 | 100 | 100 |
| | | 1:5 Leaf leachate | 90 | 90 | 90 |
| | | Conc. leachate | 100 | 100 | 100 |

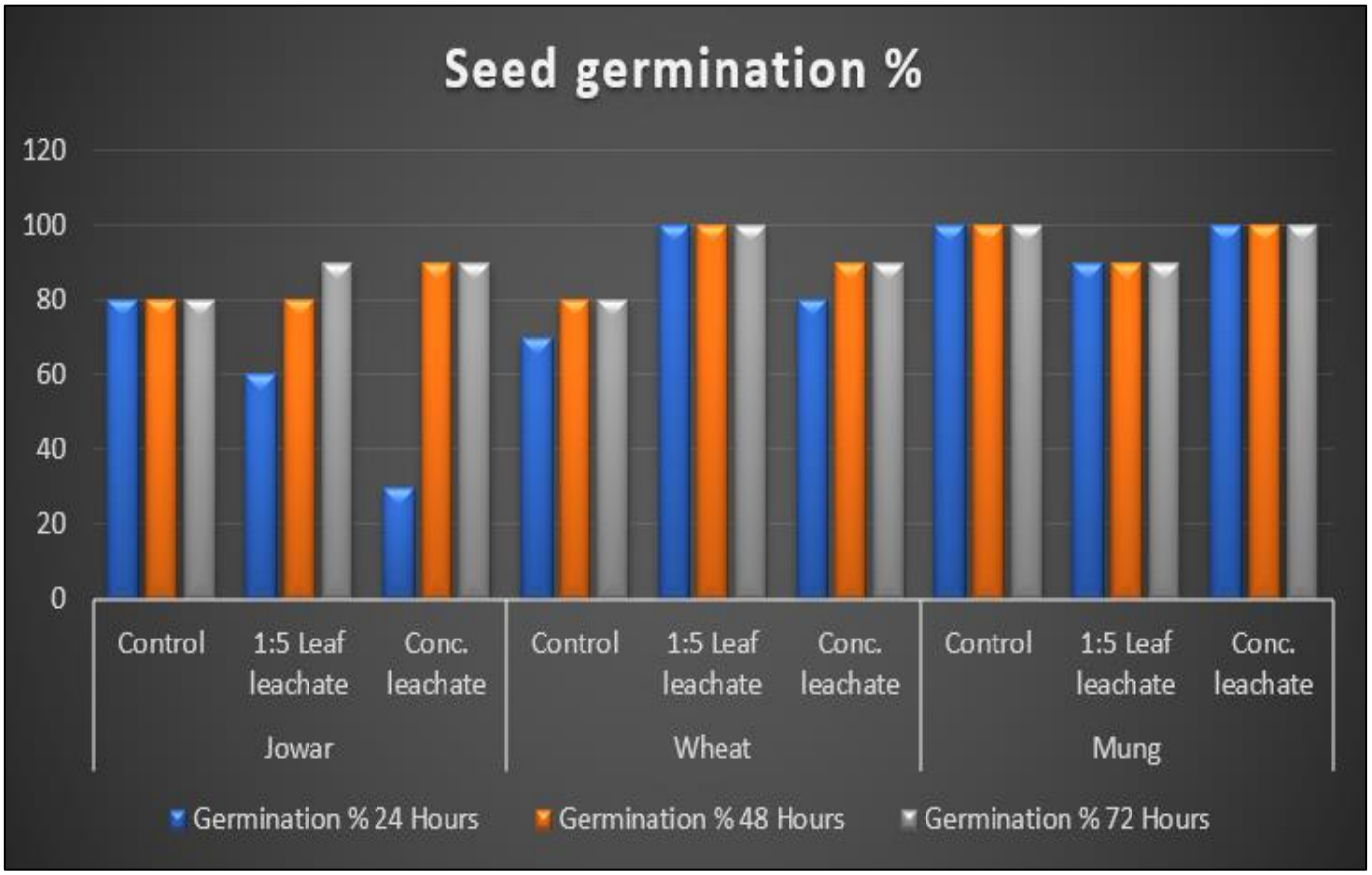


Fig 4 Effect of *M. Indica* Leaf Leachate on Seed Germination % of Different Crop Seeds.

Table 3 Effect of *S. Cumini* Leaf Leachate on Average Root and Shoot Length (cm) of Different Crop Seeds.

| Sr. No. | Seed treated | Treatment | Average root length (cm) 120h | Average shoot length (cm) 120h |
|---|---|---|---|---|
| **1** | **Jowar** | Control | 2.46 | 1.13 |
| | | 1:5 Leaf leachate | 3.71 | 1.38 |
| | | Conc. leachate | 1.73 | 0.38 |
| **2** | **Wheat** | Control | 2.96 | 1.75 |
| | | 1:5 Leaf leachate | 4.51 | 1.99 |
| | | Conc. leachate | 2.23 | 1.18 |
| **3** | **Mung** | Control | 2.36 | 3.07 |
| | | 1:5 Leaf leachate | 2.73 | 3.68 |
| | | Conc. leachate | 2.05 | 2.52 |

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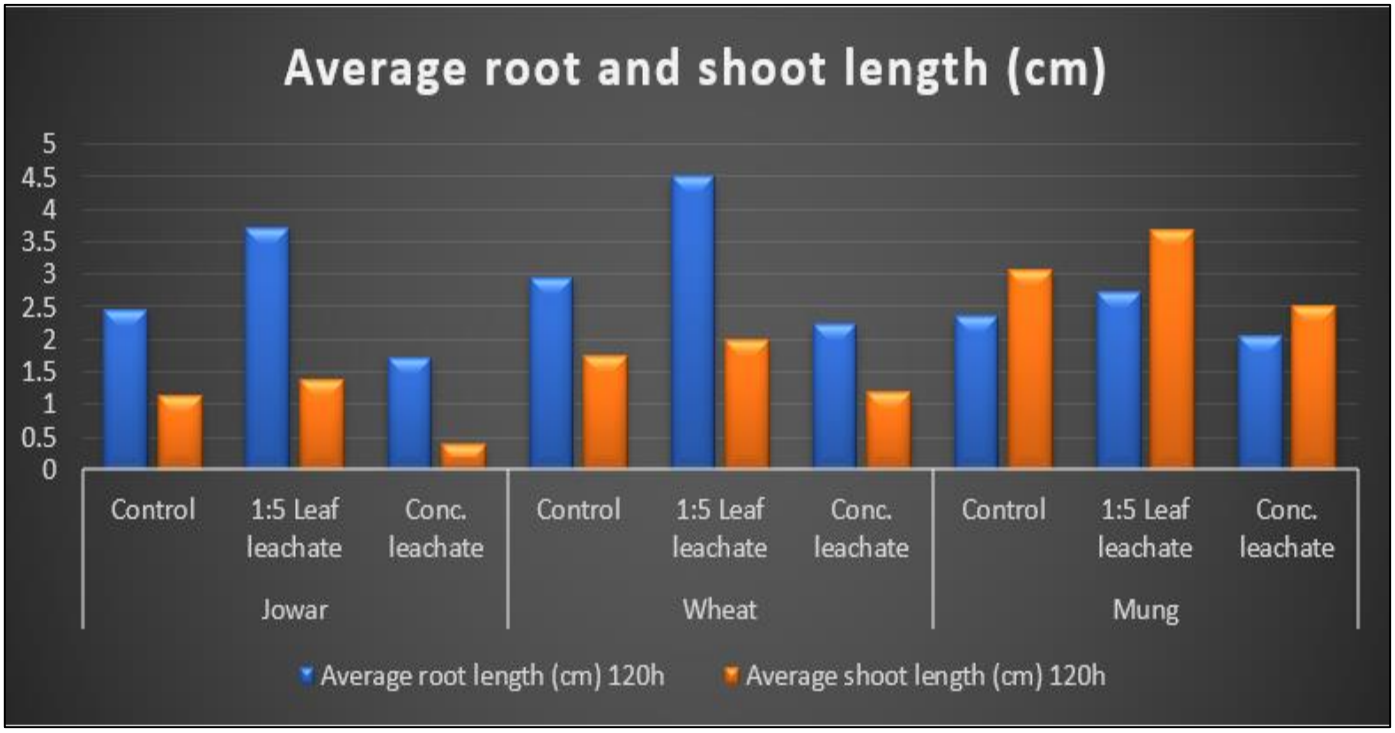


Fig 5 Effect of *S. Cumini* Leaf Leachate on Average Root and Shoot Length (cm) of Different Crop Seeds

Table 4 Effect of *M. Indica* Leaf Leachate on Average Root and Shoot Length (cm) of Different Crop Seeds.

| Sr. No. | Seed treated | Treatment | Average root length (cm) 120h | Average shoot length (cm) 120h |
|---|---|---|---|---|
| **1** | **Jowar** | Control | 2.14 | 1.11 |
| | | 1:5 Leaf leachate | 1.11 | 0.9 |
| | | Conc. leachate | 1.16 | 1.02 |
| **2** | **Wheat** | Control | 2.9 | 1.5 |
| | | 1:5 Leaf leachate | 6.49 | 4.21 |
| | | Conc. leachate | 2.8 | 0.8 |
| **3** | **Mung** | Control | 3.09 | 1. 90 |
| | | 1:5 Leaf leachate | 2.8 | 1.2 |
| | | Conc. leachate | 3.0 | 1.49 |

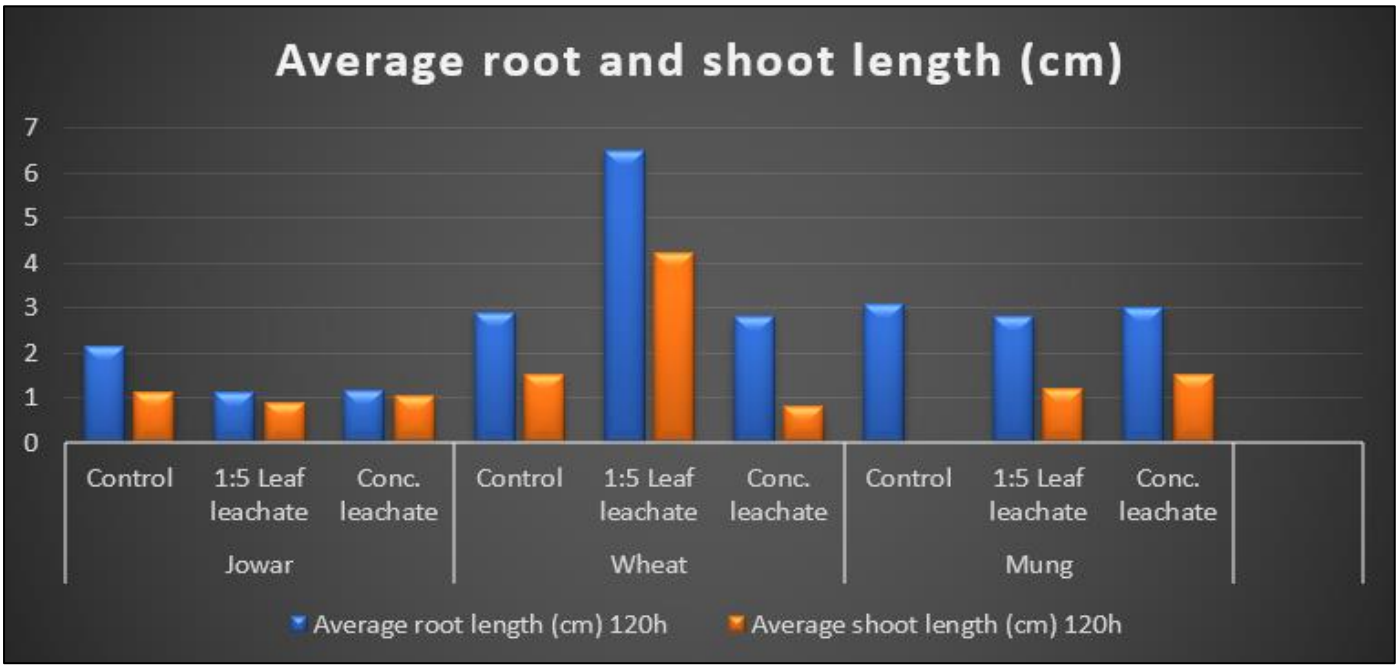


Fig 6 Effect of *M. Indica* Leaf Leachate on Average Root and Shoot Length (cm) of Different Crop Seeds.

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## III. RESULT AND DISCUSSION

The present study investigated the allelopathic effects of *M. indica* and *S. cumini* on the germination and primary growth of wheat (*Triticum aestivium*), Jowar (*Sorghum bicolor*), and Mung (*Vigna radiata*) seeds. *M. indica* leaf leachate enhances germination % in Jowar, wheat, and Mung seeds, as well as average root shoot length, at a 1:5 concentration in all seeds. *S. cumini* concentrated leaf leachate enhances germination % in Jowar, Wheat, and Mung seeds, while average root shoot length increases in all seeds at a 1:5 concentration. These two plants have positive allelopathic properties that boost the germination percentage and plant growth of wheat, jowar, and mung seeds. Khan *et al*. (2008) noticed that aqueous extracts of *Eucalyptus camaldulensis* L. at a concentration of 10, 15 and 20% had inhibitory effect on wheat seed germination and effect was found significantly higher than control treatment. Dessalegne Gella et al., (2013) found highest reduction in wheat seed germiantion by treatment of aqueous extract of P. hysterophorous L. Allelochemicals released by plants can reforme interactions among organisms, community dynamics into the soil environment and also regulate the growth of plants in the soil (Meiners et al., 2017) Allelochemicals can be affected by Cellular structure, metabolism, photosynthesis, enzyme activity, nutrient absorption and hormonal regulation of target plant (Rehman et al., 2019) Secondary metabolites (flavonoids, glycosides, steroids and diterpenoids) of some medicinal and aromatic plants accounted for allelopathic activity (Mathela 1994). Based on the findings described, some of phytotoxic substances of *M. indica* and *S. cumini* may be released into the soil as leaf leachate and they shows positive allelopathic impact on seed germination and seedling growth of these crop plants.

## IV. CONCLUSION

*M. indica* and *S. cumini* demonstrate beneficial allelopathic potential, which boosts seed germination of wheat, jowar, and mung and growth. The investigation revealed that *M. indica* and *S. cumini* leaves are effective as green manure for these crop plants, as well as for growing these plants around the farmyard.

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