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Research Article

Effect of Foliar Application of Moringa Leaf Extract (MLE) on Growth and Yield of *Gossypium hirsutum*

Madiha Nisar[1]*, Muhammad Nasir[1], Shahid Saleem[1], Muhammad Umar Iqbal[2] and Tabinda Athar[3]

[1]*Rural Education and Economic Development Society, Rahim Yar Khan, Pakistan*

[2]*Better Cotton Initiative, Lahore, Pakistan*

[3]*Institute of Soil and Environmental Sciences, University of Agriculture, Faisalabad, Faisalabad, Pakistan*

***Corresponding Author:** Madiha Nisar, Rural Education and Development Society (REEDS), Rahim Yar Khan, Pakistan.

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Abstract

Moringa oleifera leaf extract (MLE) is rich in nutrients having ascorbate, amino acids, minerals, zeatin, antioxidants, vitamins, iron, calcium, potassium, and numerous other compounds that have the potential of growth enhancement. An experiment was conducted in Rahim Yar Khan in 2019 during the cotton cropping season to study the effects of MLE on cotton crop. The growing site was properly prepared by using appropriate cultivation practices. A recommended dose of chemical fertilizers NPK 150:50:50 was applied with an interval of 15 days. Moringa leaf extract was made by using 3 kg healthy moringa leaves and was sprayed on the crop in 3 replications and 3 treatments i.e., MLE + NPK (T1), NPK (T2) and Control (T3) where no MLE and NPK was applied. The experiment was conducted by following Randomized Complete Block Design and separate blocks were used for each treatment. The data was collected before each application of (MLE) and maximum yield was observed in the treatment having MLE extract and NPK. The results showed that application of MLE significantly increased the yield of cotton and therefore, it can be used as an organic fertilizer for maximizing cotton yield.

Keywords: Moringa Leaves Extract (MLE); Cotton; Growth Promoters; Foliar Application, Growth, Yield

Abbreviations

MLE: Moringa Leaf Extract.

Introduction

Cotton *(Gossypium hirsutum)* is considered as a backbone of the Pakistan's economy. It has significant contribution in Pakistan's agricultural economy and shared about 0.8 percent in GDP and 4.5 percent in agriculture value addition [1]. Cotton is a renowned fiber crop and supports one of the world's largest textile industries with an annual economic impact of $600 billion globally. Therefore, sustainable production per unit area must be ensured to maximize textile activities and to minimize environmental footprints of cotton production . The use of synthetic growth promoters to enhance crop productivity directly increases production cost and environmental pollution, therefore there is a significant exigent need to promote the use of natural and sustainable regulators. While there has been a good shift in the farmer's preference to improve cotton growth and production by using natural growth regulators [2].

Moringa oleifera extract (MLE) is rich source of potassium, iron, calcium, ascorbate, amino acids and growth-promoting hormones like zeatin, and significantly helps to promote cotton growth on

sustainable basis [3], by increasing photosynthesis that in turn speeds up the flowering and fruit formation [4]. Yasmeen., *et al.* [5] narrated that the leaf extract of moringa enhances the growth of young plants, increases their lifespan, produces a greater number of roots, shoots, leaves, and superior fruits, develops resistance against diseases and pests and generally increase the yield up to 20-35%. Moreover, it also develops resistance against salinity [6], drought, and heavy metal stress [7].

Moringa has wide adaptation to the various geographical locations and its potential role for alleviation of nutritional deficiencies, especially in the poor population have been reported [8]. Moringa has fast-growing and persistent nature, and produces abundant biomass. Various nutritional benefits can be attained from fresh leaves as they are rich sources of antioxidants, plant metabolites and osmo-protectants that make it a natural tonic for plant growth [6]. Apart from acting as a growth enhancer, MLE is environment friendly, cheap, and easily accessible so it can cause a significant increase in crop production [9]. Moringa leaves are easily available also affordable, therefore farmers can easily make their MLE and can use it as a cheap, readily available, and efficient organic fertilizer.

Methodology

A farmer's field in District Rahim Yar Khan was selected during 2019-2020 cropping season to conduct this research trial. There were separate plots which were replicated three times using Randomized Complete Block Design (Detailed treatment plan is in table 1). The plots were managed with all required agronomic practices and during land preparation, chemical fertilizer NPK (Nitrogen, Phosphorus and Potassium) applied in two treatment plots @ 150:50:50 while in control plot there was zero application of chemical fertilizer. The seeds which were used in this trial was purchased from Punjab seed corporation Rahim Yar Khan and moringa leaves to obtain extract collected were obtained from farmer's field. The leaf extract was applied at 15 day interval and data were collected before each application.

Plant extract preparation

3 kg of fresh moringa leaves were collected from a farmer's field. The collected leaves after weighing were wrapped in cheesecloth and crushed using a wooden stick. This wrapped leaves after crushing were dipped in a backpack spray tank like tea bags for 10-15 minutes or dipping for multiple times to get the extract. The resulting extract was diluted before spraying [10].

Application of moringa leaf extract

Fresh leaf extract was equally distributed in 3 spray tanks all having capacity of 20L and filled with water. This was then diluted and applied as a foliar spray.

Treatments	Name	Dosage per acre
T1	MLE + NPK	3 Kg leaves extract + 150:50:50
T2	NPK	150:50:50 NPK
T3	Control	0 MLE & NPK

Table 1

Results

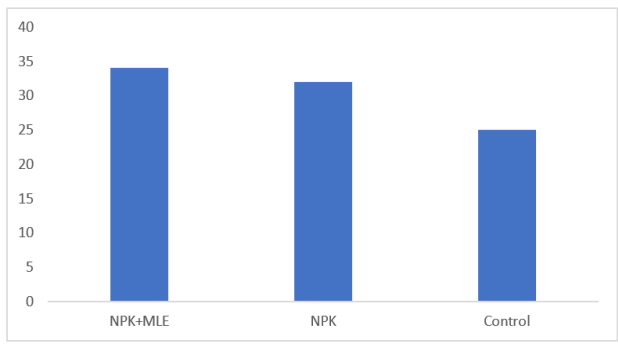

Figure 1: Comparison of treatments on number of shoots of *Gossypium hirsutum.*

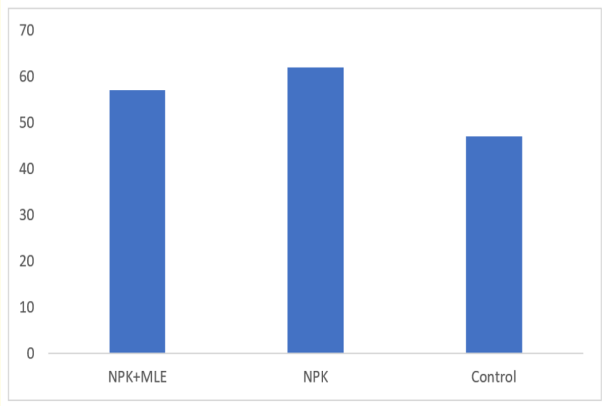

Figure 2: Comparison of treatments on plant height of *Gossypium hirsutum.*

Figure 3: Comparison of treatments on open and unopened bolls of *Gossypium hirsutum.*

Figure 4: Comparison of treatments on yield (kg) of *Gossypium hirsutum.*

Discussion

The results incorporated after statistical analysis and showed that moringa leaf extract has a significant effect on the yield of cotton. The results showed that the combination of NPK and MLE gives higher number of shoots as compared to the treatment where only NPK was applied while control treatment has less number of shoots. Where MLE was applied in combination of NPK plant, development of maximum shoots compared to the treatment where only NPK applied was observed. A number of unopened and opened bolls were also more in combined dose whereas plant gains height in treatment having just NPK application. This decrease in height in the combined dose is also because plant move towards more fruiting than height while on the other hand where just NPK was applied fruiting was a little less and plant moves towards height. Comparing the results of the combined application of MLE and NPK also separate application of NPK with control treatment showed that there is a smaller number of branches, opened and unopened bolls per plant also height reduced. For yield, it was clear from results that maximum production after two pickings obtained from the combined application of MLE and NPK while control treatment gives the minimum production.

Plant growth regulators play a dynamic role in the regulation of growth direction and type, crop development resulting yield [11]. Growth regulators application timing and dose can enhance the yield of the crop [12]. The results are similar to the findings of Muhammad, 2014 who states that MLE enriched with iron, calcium, potassium, ascorbate, amino acids especially zeatin proved an excellent growth enhancer and can increase the yield of the crop from 10-45%. Yield and growth of the crop are reported to increase with the application of moringa leaf extract, as a sufficient amount of micronutrients in adequate proportion is present in it. The crop yield increases for a variety of crops that range from sugar crops to fiber, oil crops to cereals, and tuber to forage. Exogenous application of MLE can result in more photosynthetic pigments, higher leaf area, and yield of the crop [13] which is similar to the present study findings in case of yield of *Gossypium hirsutum*. The findings of [14] on number of bolls per plant greatly influence the yield of seed cotton also justify the results of current study. Results of different studies showed that the presence of cytokinin in MLE results in larger and a greater number of fruits [15]. Many research on different crops showed the same results; on tomato [16], kidney beans, and onion.

Conclusion

The results of the present study revealed that foliar application of moringa leaf extract (MLE) give good crop production and can used as an organic fertilizer. According to the previous studies carried by researcher's the extract is environment friendly having no negative effects on crop quality, environment, and soil also being cheaper and easily available it could recommend to farmers with the purpose to get maximum yield using available resources to cope with the emerging threat of hunger.

Bibliography

1. Government of Pakistan. Economic survey of Pakistan (Ministry of Finance, Ed.) (2019).

2. Wei Wei., *et al*. "Estimating the Economic Viability of Cotton Growers in Punjab Province, Pakistan". *SAGE Open* 10.2 (2020): 2158244020929310.

3. Fuglie Lowell J. The miracle tree; the multiple attributes of moringa. No. 634.97 M671. Technical Centre for Agricultural and Rural Co-operation, Wageningen (Países Bajos) (2001).

4. Moyo Busani., *et al*. "Nutritional characterization of Moringa (Moringa oleifera Lam.) leaves". *African Journal of Biotechnology* 10.60 (2011): 12925-12933.

5. Yasmeen Azra., *et al*. "Economic analyses of sole and combined foliar application of moringa leaf extract (MLE) and k in growth and yield improvement of cotton". *International Journal of Agriculture and Biology* 20 (2018): 857-863.

6. Rady Mostafa M., *et al*. "Integrated application of salicylic acid and Moringa oleifera leaf extract alleviates the salt-induced adverse effects in common bean plants". *International Journal of Agricultural Technology* 11.7 (2015): 1595-1614.

7. Howladar Saad M. "A novel Moringa oleifera leaf extract can mitigate the stress effects of salinity and cadmium in bean (Phaseolus vulgaris L.) plants". *Ecotoxicology and Environmental Safety* 100 (2014): 69-75.

8. Abohassan R A and A O Abusuwar. "Effects of Moringa olifera leaf extracts on growth and productivity of three leguminous crops". *Legume Research-An International Journal* 41.1 (2018): 114-119.

9. Price Martin L. "The moringa tree". *ECHO Technical Note* 17391 (2007): 1-19.

10. Yasmeen Azra., *et al*. "Performance of late sown wheat in response to foliar application of Moringa oleifera Lam. leaf extract". *Chilean Journal of Agricultural Research* 72.1 (2012): 92.

11. Anjum S A., *et al*. "Brassinolide application improves the drought tolerance in maize through modulation of enzymatic antioxidants and leaf gas exchange". *Journal of Agronomy and Crop Science* 197.3 (2011): 177-185.

12. Hassanpouraghdam., *et al*. "Note on the enzyme activities, productivity and quality parameters of chickpea cultivars under influence of diverse synthetic plant growth promoters". *Indian Journal of Agricultural Research* 49.4 (2015): 327-332.

13. Iqbal Muhammad Aamir., *et al*. "Response of canola to foliar application of moringa (Moringa olifera L.) and brassica (Brassica napus L.) water extracts". *International Journal of Agriculture and Crop Sciences (IJACS)* 7.14 (2014): 1431-1433.

14. Bibi, Zarina., *et al*. "Response of Gossypium hirsutum genotypes to various nitrogen levels". *Pakistan Journal of Botany* 43.5 (2011): 2403-2409.

15. Foidl Nikolaus., *et al*. "The potential of Moringa oleifera for agricultural and industrial uses". *The miracle tree: The multiple attributes of Moringa* (2001): 45-76.

16. Mohammed R., *et al*. "Evaluation of different concentrations and frequency of foliar application of moringa extract on growth and yield of onion, Allium cepa Lam". *Agrosearch* 13.3 (2013): 196-205.