

Assessment of growth stimulating property of *Moringa* leaf extract (MLE) using *Vicia faba* as test plant

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ABSTRACT

Moringa is a miraculous plant having combination of antioxidants, amino acids, macro and micronutrients, minerals and vitamins. The objective of the present study was to assess the growth promoting properties of Moringa (*Moringa oleifera*) leaf extract by opting *Vicia faba* as test plant. Germination percentage was calculated after sowing the soaked *Vicia faba* seeds in different concentrations of MLE like 10%, 20%, 30% and 50% for 6 hours. Soil application of MLE was also given. Foliar spray with the solutions of different concentrations of MLE was done once every week after emergence till 30 days and the growth parameters like average germination, number of leaves emergence, height of plant, shoot length(cm), root length (cm), shoot and root fresh and dry weight(g) had been recorded. All the concentrations of MLE promoted all the growth parameters as compared to control, but greatest enhancement in the test plant vigour was shown by 50 % of MLE. So it was concluded that *Moringa* leaf extract acts as a potent, natural, eco friendly growth stimulator. It can be used to improve the growth and development of a variety of plants. In future it could be prove to be a boon for the underprivileged farmers, who are not able to purchase the expensive fertilizers and manure due to financial constrains.

Key words : *Moringa oleifera*, *Moringa* leaf extract (MLE), Natural growth enhancer, *Vicia faba*

Introduction

With the increasing population, demand of food is increasing day by day. In order to fulfill the requirement and gaining huge profit, farmers usually add chemical fertilizers in their soil. Fertilizers contain macronutrients and micronutrients, which a plant needs to grow fast. Chemical fertilizers help farmers to produce more and high-quality crops in the short time, but in long run these may lead to fewer or poor quality crops. Along with many adverse effects like soil acidification, heavy metals pollution, soil compaction and changes in soil microbiome, it also leads to degradation of soil and environment (Gao, 2001; Phiri, 2010; Lan and Xia, 2008). Furthermore the in-

organic chemical fertilizers are expensive, which put financial burden on the farmers and a number of poor farmers are not able to afford it. Thus, there is a need to find out an alternative which is natural, safe, cheap and act as an effective source of plant growth stimulator. Being rich in a number of nutrients, *Moringa* is one of the most potent option for enhancing the growth of the plants.

Moringa oleifera is native of sub-Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan (Nikkon *et al.*, 2003). *Moringa* is the only genus of family Moringaceae. Out of many species *Moringa oleifera* is most popular and extensively grown species. It is commonly known as Drumstick tree, Horseradish tree, Ben oil tree etc. *M. oleifera* is a fast-

growing, small to medium-sized deciduous tree. Although all parts of *Moringa* has amazing nutritional and medicinal properties, but the leaves are the most potent part of the plant.

The leaves of *M. oleifera* are the rich source of proteins, vitamins, minerals, essential amino acids etc. (Kasolo *et al.*, 2010; Mbikay, 2012; Mahmood *et al.*, 2010). Its leaves contain powerful natural antioxidants (Siddhuraju and Becker, 2003). Besides it, MLE is rich in ascorbate, phenolics and many essential plant minerals such as Ca, K, Mg, Mn, P, B, Zn, and Fe, which are important for growth and development of the plants, thus can be used exogenously as plant growth enhancers (Basra *et al.*, 2011; Hussain *et al.*, 2013; Yasmeen *et al.*, 2013; Nouman *et al.*, 2012 a). According to Price (2007) extracts from fresh *Moringa* leaves can increase yield of any crop by 25-30%.

Vicia faba is also known as faba beans, broad beans or horse beans. It is a multipurpose crop used for both food and fodder (Prolea, 2014). Faba bean also plays an important role in biological fixation of aerial nitrogen (Jelenic *et al.*, 2000). So the current study was planned to assess the growth potentiality of *Moringa* leaf extract (MLE) on *Vicia faba* plant using various growth parameters.

Materials and Methods

Preparation of *Moringa* leaf extract (MLE)

Young Fresh leaves of *M.oleifera* were collected from the botanical garden of Post Graduate Govt. College for Girls, Sector 11, Chandigarh and its leaf extract (MLE) was prepared by adding 200 ml of water and using a conventional electric mixer (10000 rpm). The mixture was sieved through a clean muslin cloth to separate the leaf extract from the residue. The extract was further filtered twice through (Whatman No. 1) filter paper and then collected as stock solution. Four different concentrations like 10%, 20%, 30% and 50% were prepared by adding distilled water to the stock solution (Table 1).

The experiment was conducted in the greenhouse of PGGCG-11, Chandigarh as pot experiment. The investigation was carried out in two steps:

First step

(a) Seed soaking

Seeds of *Vicia faba* were soaked in MLE solution at different concentration levels of 10%, 20%, 30% and 50% for 6 hours. Some seeds were soaked in water

only and used as control. The treated seeds were sown into the earthen pots filled with 3.5 kg of homogeneous loamy clay soil. Experiment was set in three replicate for each concentration. 100 ml of MLE of all the concentrations (10%, 20%, 30%, 50%) were added into each pot, three days after transplanting, while only distilled water was used in control one. All pots were kept in a greenhouse. After 10 days from sowing seeds, it was checked for recording the germination percentage. Germination percentage was calculated according to Adetimirin, (2008).

$$\text{Germination percentage (GP\%)} = \frac{\text{Number of emerged seedlings}}{\text{Total number of seeds}} \times 100$$

Second step

(b) Seedlings foliar spray with MLE

After appearance of the first true leaf, the seedlings were sprayed with the solutions of MLE at the levels of 10%, 20%, 30% and 50% once every week till 30 days. 25 ml. of each concentration of MLE was sprayed and hand sprayer was used for it. The controlled seedlings were left to grow without MLE foliar spray.

(c) Data recorded

Ten seedlings for each concentration were sampled randomly after 40 days from sowing to measure the different growth parameters and their mean value was calculated. The following parameters had been observed -

(i) Number of leaves emergence per plant

The numbers of leaves/plant were determined by counting the number of leaves.

(ii) Plant height (cm)

Plant height was measured from soil surface to tip of the tallest branch.

(iii) Shoot and root lengths (cm)

Shoot and root lengths were measured at the time of harvest. The length was measured from the point where the root and shoot joins to the end of root for root length and to the top of shoot for shoot length.

(iv) Root and shoot fresh weights (g)

After harvesting the seedlings, the shoot was cut from root at the point where they joined together. The fresh weight was recorded for each part separately by using digital balance.

(v) Root and shoot dry weights (g)

The samples were dried in an oven at 70 °C up to constant dry weight. The dry weight was recorded for root and shoot separately by using digital balance.

Results and Discussion

Data in Table 2 clearly indicated that, soaking *Vicia faba* seeds in different concentrations of *Moringa leaf* extract (MLE) and its soil application showed a positive effect on seed germination over control. The value of seed germination was articulated in the form of germination percentage. The increase in germination % showed a parallel relationship with the increasing concentrations of MLE from 10% to 50%. The maximum percentage of germination was showed in 50% MLE treatment (96.7 %) as compared to control (73.3%). The stimulatory effect of MLE was also reported in many crops like - in maize (Iftikhar, 2009), in cowpea (Phiri and Mbewe, 2010), in tomato seeds (Bashir *et al.*, 2014) and in pepper (Hala *et al.*, 2017).

Table 1. Various concentrations of MLE (*Moringa leaf* extract) taken for the experiment

| Sr.No. | Treatment | Concentration of MLE (%) |
|--------|-----------|--------------------------|
| 1 | T1 | 10% |
| 2 | T2 | 20% |
| 3 | T3 | 30% |
| 4 | T4 | 50% |
| 5 | control | 0% |

It is clear from Table 2 that in the present study the application of *Moringa leaf* extract (MLE) also effectively enhanced the seedling vigour in a dose dependent manner. 10% of MLE showed minimum enhancement, however its value was more than control value for all the growth parameters. Although there is a gradual increase in the value of all the

Table 2. The assessment of various growth parameters of *Vicia faba* after treating with different concentrations of *Moringa leaf* extract (MLE)

| Treatment | Germination % | Mean No.of leaves | Mean PH (cm.) | Mean RL (cm.) | Mean SL (cm.) | Mean RF wt. (g.) | Mean SF wt. (g.) | Mean RD wt. (g.) | Mean SD wt.(g.) |
|-----------|---------------|-------------------|---------------|---------------|---------------|------------------|------------------|------------------|-----------------|
| T1 | 83.3 | 9.4 | 69.7 | 8.2 | 72.1 | 2.949 | 9.015 | 1.029 | 4.126 |
| T2 | 86.7 | 10.1 | 73.9 | 9.8 | 75.1 | 2.999 | 10.359 | 1.094 | 4.706 |
| T3 | 93.3 | 11.8 | 80.5 | 10.6 | 81.8 | 3.128 | 11.183 | 1.243 | 5.071 |
| T4 | 96.7 | 14.7 | 83.3 | 11.2 | 84.6 | 4.243 | 11.900 | 1.250 | 5.522 |
| Control | 73.3 | 8.7 | 57.3 | 7.7 | 60.7 | 2.472 | 8.970 | 1.012 | 3.571 |

growth parameters, but most pronounced stimulatory effect was shown in 50% of MLE treatment (Table 2). The present findings are in conformity with the study of Muhammed *et al.*, (2013), who also reported maximum effect on the growth of *Allium cepa*, when treated with 50% MLE. The stimulatory effect of MLE was also recorded by a number of scientists in different crops (Ali *et al.*, 2015; Biswas *et al.*, 2016; Zahan *et al.*, 2017). Being rich in plant hormones, essential amino acid and several minerals, *Moringa leaf* extract (MLE) act as a natural growth stimulant (Prolea, 2014; Rady *et al.*, 2015). *Moringa* leaves are the rich source of zeatin, a form of growth hormone cytokinin (Nagar *et al.*, 2006). The presence of a number of micronutrients in sufficient amount and in suitable proportion in MLE are responsible for increased growth of a variety of crops (Phiri and Mbewe, 2010; Muhamman *et al.*, 2013). It was also proved that foliar application of *M. oleifera* leaf extract is beneficial for the vigorous growth and the crops develop capacity to withstand under adverse environmental conditions (Kannaiyan, 2000; Chang *et al.*, 2007).

Conclusion

By the above results and discussion it can be concluded that *M. oleifera* leaves extract executed as an efficient development booster for *Vicia faba*. The supplement through natural assets is the need of an hour in the present evolving situation. *Moringa leaf* extract can act as an excellent natural substitute for the chemical fertilizers because of its high nutritive value, growth promoting nature, cost effectiveness and easy accessibility. It could prove to be the best choice of farmers in the near future.

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