Review Article

ENHANCING THE OILSEED CROPS THROUGH MICRONUTRIENT FERTILIZATION

ABSTRACT

After the United States, China, and Brazil, India is the fourth-largest economy in the world for vegetable oil. Oilseeds are grown over an area of 26.77 million ha in India, where they produce 33.55 million tons and productivity of 2549 kg ha^{-1}, respectively. Rainfed farming is the only method allowed for growing oilseeds, and small and marginal farmers cultivate the majority of this land. Plants need micronutrients for growth; however they need them in comparatively lesser amounts. Iron (Fe), manganese (Mn), zinc (Zn), boron (B), copper (Cu), molybdenum (Mo), and chlorine are some of them. Specific micronutrients in oilseeds are important for the translocation of photosynthates, raising the proportion of seeds that set, essential for the translocation of sugar, pollen grain germination, stigma receptivity, amino acid and protein synthesis, and finally boosting seed production.

Keywords: Growth, Micronutrients, Oilseed crops, Productivity

INTRODUCTION

The term "micronutrient" refers to seven of the sixteen basic plant nutrients. Micronutrients are necessary for plant growth, yet plants only need a little amount of them. These include copper (Cu), molybdenum (Mo), boron (B), zinc (Zn), iron (Fe), manganese (Mn), and chlorine (Cl). Certain micronutrients in oilseeds are crucial for the translocation of photosynthates, raising the proportion of seeds that set, transporting sugar, germination of pollen grains, stigma receptivity, and synthesising amino acids and proteins, all of which boost the production of oilseed crops. The majority of small and marginal farmers cultivate the about 72% of the total oilseeds land that is only suitable for rainfed production. Due to the introduction of high yielding cultivars, rising cropping intensity, use of high analytical fertilizers, and restricted use of organic manures, the issue of micronutrient insufficiency is becoming increasingly urgent.

These are the reasons why oilseed crops production get down. The yield of oilseed crops must thus be increased by implementing the appropriate micronutrient management strategies.

The studies of the numerous researchers reviewed in present study suggested that growth, yield, yield parameters, nutrient content and uptake of oilseed crops may all be significantly influenced by micronutrient management practices.

Effect of micronutrients on growth and yield of oilseed crops

Oilseed crops are an important source of essential nutrients, such as protein, vitamins, and minerals. They are also high in fatty acids, which are important for proper cell function and health. The micronutrient management growth parameters of oilseed crops include the selection of appropriate varieties and soil conditions, the use of fertilizers and other inputs, and the timing of harvest and storage. Soil nutrient status is another key component of micronutrient management growth parameters for oilseed crops.

Kulkarni *et al*. (2002) concluded that foliar application of boron @ 0.2 % at 45 and 55 DAS of sunflower has recorded significantly higher number of leaves (11.9 plant^{-1}) and dry matter production (45.4 g plant^{-1}) as compared to control 10.4 leaves plant^{-1} and 39.3 g plant^{-1} of dry matter production of sunflower. This was mainly due to boron helps in cell differ nation, translocation of photosynthates that leads to increase number of leaves and dry matter production.

Sharma and Jain (2003) reported that foliar application of zinc @ 0.5 % at flower initiation and 50 % flowering stage in Indian mustard has recorded significantly higher plant height (166.2 cm) and primary branches (7.17 plant^{-1}) as compared to control (154.6 cm and 5.00 plant^{-1}, respectively). This was mainly due to application of zinc helps in activation of many enzymes and helps in utilization of nitrogen.

Tejeswara Rao and Subbaiah (2006) reported that combined foliar application of micronutrient recorded significantly higher plant height (176 cm), primary branches (7.0 plant^{-1}) and dry matter production at different stages of Indian mustard as compared to control (144 cm, 5 plant^{-1} and dry matter production at different stages, respectively).

Ravi *et al*. (2008) reported that combined foliar application of iron @ 0.5 % + zinc 0.5 % at 30 and 65 DAS of safflower has recorded significantly higher growth parameters like plant height (97.5 cm), no. of leaves (81.5 plant^{-1}), primary (10.8 plant^{-1}), secondary (17.3 plant^{-1}) and dry matter production (2440.7 kg ha^{-1}) as compared to control (80.4 cm, 65.4 plant^{-1}, 7.6 plant^{-1}, 13.7 plant^{-1} and 2029.6 kg ha^{-1}, respectively).

Harikrishna *et al*. (2020) concluded that application of boron @ 1.5% + molybdenum @ 1.5 kg ha^{-1} significantly increases the dry weight $plant^{-1}$ (41.66 g $plant^{-1}$), crop growth rate (7.84 $g/m^2/day$), number of pods $plant^{-1}$ (21.16), pod yield (3.73 t ha^{-1}) and haulm yield (10.73 t ha^{-1}) of groundnut over control. Ramprosad *et al*. (2020) found that application of boric acid @ 0.30% prominently increases the pod yield (30.77 g $plant^{-1}$) of groundnut over control (RDF alone).

Gayatri Devi *et al.* (2005) observed that application of 75 per cent recommended NPK + *Rhizobium* seed treatment + phosphorus solubilizing bacteria @ 2 kg ha^{-1} along with FYM @ 5 t ha^{-1} significantly increased the available Fe (72.36 mg kg^{-1}), Mn (8.29 mg kg^{-1}), Cu (0.68 mg kg^{-1}) and Zn (1.00 mg kg^{-1}) in groundnut, respectively. Chattopadhay and Mukhopadhyay (2004) reported that foliar application of boron in the form of borax @ 0.3% registered significantly higher seed yield of 1050 kg ha^{-1} over control in soybean. Ross *et al.* (2006) found that application of boron as borax @ 1.5 kg ha^{-1} significantly increased pod (1142 kg ha^{-1}) and haulm yield (3025 kg ha^{-1}) of soybean over control.

Longkumer *et al.* (2017) indicated that application of borax @ 2.0 kg ha^{-1} along with recommended dose of NPK recorded the highest yield characters *viz.*, number of seeds pod^{-1} (2.93), number of pods $plant^{-1}$ (82.33) and seed yield (2295 kg ha^{-1}) of groundnut as compared to control (NPK alone).

Tahir *et al.* (2012) revealed that application of solubor @ 2 kg ha^{-1} gave significantly higher number of pods $plant^{-1}$ and seed yield of soybean over control. Verma *et al.* (2012) reported that application of solubor @ 1.0 kg B ha^{-1} significantly increased the number of pods $plant^{-1}$ (122.11), seed yield (2051 kg ha^{-1}) of mustard. Singh *et al.* (2012) revealed that application of borax @ 1.0 kg B ha^{-1} recorded the highest pod yield (2032 kg ha^{-1}) of groundnut. Ismail *et al.* (2013) reported that application of sulphur through gypsum @ 100 kg ha^{-1} and borax @ 10 kg B ha^{-1} recorded the highest seed yield (2446 kg ha^{-1}) of soybean as compare to control.

Mohsen and Jasim (2020) showed that foliar application of boron as borax @ 0.5% was registered highest yield attributes like number of pods $plant^{-1}$ (52.64), 100 kernel weight (65.59 g), shelling percentage (70%), pod yield (1237 kg ha^{-1}) and haulm yield (2397 kg ha^{-1}) of groundnut, respectively as compared to the control. Elayaraja *et al*. (2020) concluded that combined application of recommended dose of NPK fertilizer along with composted coirpith @12.5 t ha^{-1} + sulphur as gypsum @ 200 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1} + Borax @ 10 kg ha^{-1} through soil along with foliar application of Zn and B @ 0.5% twice was significantly superior in increasing the plant height (134.95 cm), dry matter production of 4646 kg ha^{-1}, seed yield (1911 kg ha^{-1}), stalk yield (3218 kg ha^{-1}) of sunflower, respectively.

Effect of micronutrients on nutrients content and uptake of oilseed crops

Chitdeshwari and Poongothai (2003) observed that the soil application of recommended dose of NPK fertilizer + Zn @ 5 kg ha^{-1} + boron @ 1.0 kg ha^{-1} along with sulphur @ 40 kg ha^{-1} significantly increased the highest Z, S and boron uptake by groundnut. Shankhe *et al.* (2003) revealed that the foliar application of boron + soil application of molybdenum along with the recommended dose of fertilizers were found to be superior in increasing boron and molybdenum uptake by groundnut over the recommended dose of fertilizers alone.

Devi *et al.* (2012) revealed that higher nutrient uptake by soyabean *viz*., N (185.18 kg ha^{-1}), P (23.18 kg ha^{-1}), K (50.78 kg ha^{-1}), S (18.71 kg ha^{-1}) and B (61.11 g ha^{-1}) were noticed with the application of sulphur and boric acid @ 45 ppm as compared to control. Verma *et al.* (2012) indicated that application of boron through solubor @ 1.0 kg B ha^{-1} significantly increased N (185.10 kg ha^{-1}), P (22.22 kg ha^{-1}), K (49.16 kg ha^{-1}), and B (59.01 g ha^{-1}) uptake by mustard, respectively over control. Ismail *et al.* (2013) noted that application of sulphur 60 kg S ha^{-1} along with borax @ 20 kg borax ha^{-1} recorded the highest N (188.11 kg ha^{-1}), P (21.11 kg ha^{-1}), K (50.18 kg ha^{-1}), S (17.16 kg ha^{-1}) and B (55.03 g ha^{-1}) uptake by summer groundnut, respectively as compared to control (without S and B). Ram *et al.* (2014) reported that application of 40 kg S ha^{-1} along with solubor @ 1.5 kg B ha^{-1} significantly increased the S (15.15 kg ha^{-1}) and B (151.07 kg ha^{-1}) uptake by groundnut.

Ramprosad *et al*. (2020) found that application of boric acid @ 0.30% foliar spray gave significantly higher N (37.1 mg g^{-1}), P (6.2 mg g^{-1}), K (8.0 mg g^{-1}) content in groundnut over control. Sathiyamurthi *et al*. (2021) reported that the highest uptake of nitrogen (3.05 g pot^{-1}), phosphorus (0.99 g pot^{-1}), potassium (2.55 g pot^{-1}), Zn (9.28 g pot^{-1}), Fe (14.47 g pot^{-1}) and Mn (6.26 g pot^{-1}) uptake in cotton was noticed with the application of 100% recommended dose of NPK in conjunction with 1.5 mg B kg^{-1} through magnesium boron humate. Haneena *et al*. (2021) noted that maximum boron content (0.73, 0.65 and 0.59 mg kg^{-1} at peg penetration, pod development and harvest stages respectively) was recorded in soil application of borax @ 12.5 kg B ha^{-1} along with RDF as compared to control.

Conclusion

These reviewed findings make it clearly evident that micronutrients are essential for the growth and development of oilseed crops. They play an important role in providing energy for the plant, regulating metabolism, and improving soil fertility. Micronutrients such as zinc, iron, manganese, and boron can help increase oilseed production by improving the crop's ability to absorb and utilize nutrients, increasing the number of flowers and fruits, and improving the quality of the oilseed. Thus the present review study concluded that micronutrient applications were significantly improved the growth and yield of oilseed crops. As a result, approaches for managing micronutrients were shown to be helpful for increasing growth, yield and nutrient absorption in oil seed crops.

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