ENHANCEMENT OF OILSEEDS CROP PRODUCTION THROUGH MICRONUTRIENT FERTILIZATION: A REVIEW

ABSTRACT

Globally India is the fourth largest economy for oilseeds after United states, China and brazil. Oilseeds are grown over an area of 26.77 million ha in India, with the production of 33.55 million tons and productivity of 2549 kg ha^{-1}, respectively. Oilseeds are majorly grown as rainfed crop especially by small and marginal farmers. Plants need micronutrients in small amounts for their growth and development.. Iron (Fe), manganese (Mn), zinc (Zn), boron (B), copper (Cu), molybdenum (Mo) and chlorine (Cl) are some of them. Specific micronutrients in oilseeds are important for the translocation of photosynthates, increased seed set along with 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 them in little amount. 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 set, transporting sugar, germination of pollen grains, stigma receptivity and synthesising amino acids and proteins, all of which boost the production of oilseed crops. Majority of small and marginal farmers cultivate about 72% of the total oilseeds on land which is solely suitable for rainfed production. With to the introduction of high yielding cultivars, rising cropping intensity, use of high analytical fertilizers and restricted use of organic manures, micronutrient deficiency has been alarmingly increasing.

These factors have led to reduced oilseeds production. Therefore the yield of oilseeds crops must increased by implementing the appropriate micronutrient management strategies. The findings of several researchers reviewed in the current study suggested that growth, yield

parameters and yield, nutrient content and its uptake of oilseed crops may all be significantly influenced by micronutrient management practices.

1. **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. Strategies to improve the growth parameters under micronutrient management includes the selection of appropriate varieties and suitable fertilizers along with the balanced use of other inputs. Here soils condition such as its nutrient status is another key component.

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}. They have reported the reason for increase was the boron helping with cell differentiation and photosynthates translocation leading to the increase in the above growth parameters".

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). They have reported that this was mainly due to application of zinc which helps in activation of many enzymes and helps in utilization of nitrogen".

Tejeswara Rao and Subbaiah (2006) reported that "combined foliar application of micronutrient like zinc and boron 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 and 5 plant^{-1}, 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), number of leaves (81.5 plant^{-1}), primary branches (10.8 plant^{-1}), secondary branches (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), crop growth rate (7.84 g m^{-2} day^{-1}), 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 increased 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 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}) content 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% 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 reported the plant height (134.95 cm), dry matter production (4646 kg ha^{-1}), seed yield (1911 kg ha^{-1}), stalk yield (3218 kg ha^{-1}) of sunflower, respectively".

2. **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 Zn, S and B 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 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 mg kg^{-1}) and B (151.07 mg kg^{-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. 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 played 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 application of

micronutrients 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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