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# Enhancement of Oilseeds Crop Production through Micronutrient Fertilization: A Review

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***Authors' contributions***

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## 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.

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## 1. 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.

## 2. 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. [1] 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 [2] 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 [3] 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. [4] 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. [5] 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. [6] 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. [7] 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 [8] 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. [9] 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. [10] 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. [11] 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. [12] 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. [13] 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. [14] 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 [15] 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. [16] 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".

## 3. EFFECT OF MICRONUTRIENTS ON NUTRIENTS CONTENT AND UPTAKE OF OILSEED CROPS

Chitdeshwari and Poongothai [17] 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. [18] 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. [19] 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. [14] 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. [6] 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. [20] 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" [21,22].

## 4. 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.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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