**Scholarly Research Journal for Interdisciplinary Studies,**
*Online ISSN 2278-8808, SJIF 2021 = 7.380, www.srjis.com*
*PEER REVIEWED & REFEREED JOURNAL, NOV-DEC, 2022, VOL- 10/74*

# EFFECT OF VARIOUS LEVELS OF CU AND CU+ZN AMENDMENT IN SOIL ON GROWTH, REPRODUCTIVE YIELDS AND BIOCHEMICAL RESPONSES OF MUSTARD (*BRASSICA CAMPESTRIS* L.) PLANTS.

**Pratiksha Raghuvanshi, Ph.D.**

*Department of Botany S V College Aligarh*

**Paper Received On:** 25 DECEMBER 2022
**Peer Reviewed On:** 31 DECEMBER 2022
**Published On:** 01 JANUARY 2023

***Abstract***

*Mustard (Brassica campestris L.) plants grown on alluvial soils in soil-pot culture. Cu+Zn (25 mg Cu+ 5mg Zn kg-1) in soil promoted growth, reproductive yield and biochemical responses of wheat and mustard. In Mustard plants common visible symptoms of Cu-toxicity such as stunted plant growth, intervenal chlorosis in younger leaves and reduced size of leaf lamina at excess supply of Cu (25 mg kg-1) in soil were observed. In mustard (Brassica campestris), tissue concentration of Cu increased with increase in Cu concentration in soil. The growth (shoot length, and dry matter yield) of plants increased by low Cu supply in soil was observed up to 2 mg kg-1 supply level. Excess Cu concentrations (25 mg kg-1), inhibited protein content by 24 and total chlorophyll content by 32%. But activity of catalase and proline content increased with increase in Cu concentration up to 25 mg kg-1 supply in soil. Maximum tissue concentration of root (60 µg g-1 dry weight) and shoot (54 µg g-1 dry weight) was observed in mustard. Cu supply in soil, showed inhibitory effects on growth and biochemical responses of mustard.*

***Key-words:*** *Reproductive yields, Biochemical responses, Inhibitory effects.*



## Experimental, Discussion and Results:

Experiments were conducted during the year 2019-2022 to study the vegetative growth, reproductive growth and biochemical effects of zinc (Zn) and copper (Cu) on certain crop plants (table 3.2). Standard methods were used to conduct the experimental works. Pot culture as well as field observation experiments were conducted to find out the objectives of the work.

| List of plant species used in the experiments **S. No.** | **Vernacular name** | **Botanical name** | **Variety** | **Family** |
|---|---|---|---|---|
| 1. | Mustard | *Brassica campestris* Linn. | TYPE-42 | Brassicaceae |

**Tissue concentration of Cu:**

Cu concentrations in shoot and root of mustard plants were increased significantly with increase in the level of applied Cu and was higher at 25 mg kg-1 Cu (table 4.2B.4). The percent increase in Cu concentration at 25mg kg-1 Cu was 871 and 500% in shoot and root of mustard respectively. At higher level of Cu, application of Zn reduced the Cu concentration in root and shoot of mustard plants (table 4.2B.4).

**Growth parameters:**

Cu and Cu+Zn amendment in the soil promoted growth of mustard at 2 mg kg-1 Cu levels singly and 25 Cu+5 Zn mg kg-1 levels in combination, while maximum reduced growth was observed at 25 mg kg-1 Cu level. Symptoms were observed in mustard plants grown in the soil amended with 25 mg kg-1 Cu, such as young leaves showed chlorosis and necrosis, retarded plant growth, reduced size of leaf lamina and thinned stem. Chlorotic leaves turned necrotic on increase in duration of Cu-exposure. After 45 days of treatment, few middle leaves were wilted and finally dried. Severity of symptoms of Cu toxicity was less in plants grown at the soil with lower concentration of Cu (5 mg kg-1 Cu). These symptoms did not appear in plants grown at 25mg Cu+5 mg Zn kg-1 levels in combination, observed after 45 days of sowing. The contaminated soil rated 25 mg kg-1 available Cu was not supported growth of mustard plants. At this level seed germination was very poor and few germinated plants early died.

**Plants height and biomass production**

In mustard, as comparison to control plants, the increase in plant height was maximum 42.6 and 73.0 cm at 2 mg kg-1 Cu application observed after 45 and 120 days of sowing respectively, later on the plant height started to decrease gradually up to 25 mg kg-1 Cu levels. Maximum reduced growth was 16.25 and 9.72% at 25 mg kg-1 Cu level observed after 45 and 120 days of sowing respectively. Compared to plants grown in 25 mg kg-1 Cu, plant height increased by 72 and 52 % exposed to 25mg Cu+5mg Zn kg-1 soil amendment observed after 45 and 120 days of sowing respectively. In mustard, dry weight of plant decreased with increased in Cu concentration, dry matter yield was maximum(62%) at 25mg

Cu+5mg Zn kg-1 soil amendment (table 4.2B.1), while fresh weight of shoot was observed to maximum(85%) at same concentration.

**Reproductive yields**

In mustard, weight of inflorescences per plant were observed to increase up to 15mg kg-1 Cu application, later on decreased to 7.3 gram per plant at 25 mg kg-1 Cu level. At 25mg Cu+ 5mg Zn kg-1 weight of inflorescences per plant were found to increased by 30.9% .Number of pods for control plant in mustard was 28.8 which were changed to 57.4, 48.4, 61.3, 37.6 and 64.6 exposed to 2, 5, 15, 25 mg kg-1 Cu levels and 25mg Cu+5mg Zn kg-1 levels. Application of 25mg Cu+ 5mg Zn kg-1 soil amendment enhanced the numbers of pods plant-1 to more than 100% compared to plants treated with 25mg kg-1Cu alone. However pod length gradually increased up to 15 mg kg-1 Cu then decreased. Also, weights per 100 seeds were found to be increased up to 15mg kg-1 Cu supply then decreasing trend seen. At 25mg Cu+ 5mg Zn kg-1 ,weight of 100 seeds were observed to increased by 76% respectively compared to value obtained at 25mg kg-1 levels alone (table apended).

| Parameters | DAYS | | | | Cu amendment (mg kg-1) in soil | | |
|---|---|---|---|---|---|---|---|
| | | Control | 2 .0 | 5 .0 | 15.0 | 25 .0 | Cu (25) + Zn(5) |
| Shoot Length (cm) | 45 | 40.6±3.48 | 42.6±2.91 (+4.92) | 39.0±5.20(-3.94) | 35.0±2.89(-13.79) | 34.0±2.31 (-16.25) | 70.0±2.89 (+72.41) |
| | 120 | 72.0±2.88 | 73.0±1.73 (+1.38) | 70.0±1.73 (-2.77) | 68.0±4.61 (-5.55) | 65.0±2.88 (-9.72) | 110±5.77 (+52.7) |

In comparison to control plants, at 120 days the increase in plant height was 1.3% in mustard plant at 2 mg kg-1 Cu exposure. At 120 days, plant height was decreased in mustard from 5 to 25 mg kg-1 Cu. At higher concentrations of copper, the root and shoot elongation was poor with a concomitant decrease in root and shoot length. At 120 days, compared to plants grown in 25 mg kg-1 Cu, plant height increased by 11 and 52% in mustard when it was exposed with 25mg Cu+5mg Zn kg-1 soil amendment. Mustard (*Brassica campestris* L.) plants grown on alluvial soils in soil-pot culture. Cu+Zn (25 mg Cu+ 5mg Zn kg-1) in soil promoted growth, reproductive yield and biochemical responses of wheat and mustard. In Mustard plants common visible symptoms of Cu-toxicity such as stunted plant growth, intervenal chlorosis in younger leaves and reduced size of leaf lamina at excess supply of Cu (25 mg kg-1) in soil were observed. In mustard (*Brassica campestris),* tissue concentration of Cu increased with increase in Cu concentration in soil. The growth (shoot length, and dry matter yield) of plants increased by low Cu supply in soil was observed up to 2 mg kg-1 supply level. Excess Cu concentrations (25 mg kg-1), inhibited protein content by 24 and total chlorophyll content by 32%. But activity of catalase and proline content increased with increase in Cu concentration up to 25 mg kg-1 supply in soil. Maximum tissue concentration of root (60 µg g-1 dry weight) and shoot (54 µg g-1 dry weight) was observed in mustard. Cu supply in soil, showed inhibitory effects on growth and biochemical responses of mustard.

**REFERENCES:**

*Agarwala, K. N., Taneja, V. and Prasad, C. (2008). Effect of low quality dietary proteins on brain protein and enzymes of glutamic acid metabolism in rats. Indian J. Med. Res.,* ***71****: 758-763.*

*Aravind, P. and Prasad, M. N. V. (2010). Carbonic anhydrase impairment in cadmium-treated C. demersum L. (free floating freshwater macrophyte): toxicity reversal by zinc. Journal of Analytical Atomic Spectrophotometry,* ***19****: 52-57.*

*Bisht, S. S., and Sharma, C. P. (2012). Zinc nutrient dependent changes in tomato (Lycopersicon esculantum) metabolism. Jounal of Plant Biol.,* ***29****: 159-163.*

*Singh, R. and Pandey, S. N. (2014). Effect of Cu application on growth, yield and biochemical responses of wheat (Triticum aestivum L.) in Gomti-upland alluvial soil. Res. Environ. Life Sci.,* ***7(3)****: 201-204.*

*Kumar A., Varshney, S. and Verma, P. S. (2009). Heavy metals contamination of vegetable foodstuffs in Jaipur (India) EJEAF Che.,* ***8(2)****: 126-131.*

*Mishra, D. and Kar, M. (2014). Nickel in plant growth and metabolism. Botanical Review,* ***40****: 292-301.*

*Pandey, N., Singh and Sharma, C. P. (2012). Effect of zinc on antioxidant response in maize (Zea mays L.) leaves. Indian J. Exp. Biol.,* ***35****: 94-96.*

*S. Savitri (2007). The study of fe and Zn effects on quantitative and qualitative parameters of winter wheat and determination of critical levels of these elements. Botanical Review,* ***35****: 112-118.*