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EFFECT OF MICRONUTRIENTS WITH AND WITHOUT SEED SOAKING AND FOLIAR SPRAY ON PRODUCTIVITY PROFIT ABILITY AND QUALITY OF CHICKPEA (*Cicer arietinum* L.)

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ABSTRACT

A field experiment was conducted during Rabi 2015-16 at Micro Plot Department of Crop Physiology, C.S. Azad university of Agriculture & Technology, Kanpur with and without seed soaking and foliar spray of Boron and Zinc nutrition on growth, yields, economics and quality of Chickpea (Cicer arietinum L.) variety of KWR-108. The experiment was conducted with different treatments i.e. control (dry), seed soaked (water), seed soaking @ 0.2% borax, seed soaking @0.5% ZnSO4, foliar spray (water), foliar spray @ 0.2% borax, foliar spray @ 0.5% ZnSO4, seed soaking + foliar spray (@ 0.2% borax + 0.2% borax), seed soaking + foliar spray (@ 0.5% ZnSO4 + 0.2% ZnSO4) adopted Randomized Black Design with three replications. Result reveled that seed soaking + foliar spray (@ 0.5% ZnSO4 + 0.5% ZnSO4) were enhanced growth observation viz: Plant height at maturity stage, number of branch plant-1, leaf area index, total dry matter plant-1 and seed yield, straw yield, harvest index (%) and quality parameters like: chlorophyll content (mg/g fresh weight), protein content (%) of chickpea variety of KWR-108 were significantly higher in comparison to other treatments. The treatment of seed soaking + foliar spray (@0.5% ZnSO4 + 0.2% ZnSo4) was found statistically higher over all treatments in respect of grass income, net return and C: B ratio in present study.

Keyword: **Seed soaking, foliar spray, Water, Boron, Zinc, Chickpea**

Chickpea (*Cicer arietinum* L.) is an important grain legume in Asia and being a rich and cheap source of protein can help people improve the nutritional quality of their diets. It is grown an consumed in large quantities from South East Asia to India and in the Middle East and Mediterranean countries. Among all pulse crops, the world consumption is second only to dry beans and has shown on increase of 33.5% in area and 65.5% volume of production since. India is producing 14.76 million tons of pulses from an area of 23.63 million hectare, which is one of the largest pulses producing countries in the world during 2015-16 (Anonymous, 2018). The problem of zinc deficiencies has been further accentuated by intensive cultivation of high yielding cultivars and use of high doses of mineral fertilizers. Zinc is closely involved in nitrogen metabolism of the plant. Zinc is required for synthesis of tryptophan which is precursor of IAA. It is involved in starch formation, starch content and activity of the enzyme starch synthesis reduced is zinc deficient plants and activation of enzymes related to carbohydrates metabolism. The main function of boron relate to cell wall strength and development cell division,

fruits and seed development, sugar transport and hormone development. Some functions of boron interrelate with those of nitrogen, phosphorus, potassium and calcium plants. The evidences of response to major elements in presence and absence iron and zinc on chickpea are lacking particularly in soils. Keeping in view above facts the present investigation was carried with the objectives viz., to find out the suitable micronutrients with and without seed soaking of chickpea production and to assess the quality and economics of treatments.

Materials and Methods

The field experiment was conducted in *Rabi* 2015-16 is micro plot at Department of Crop Physiology of C.S. Azad University of Agriculture & Technology, Kanpur. The experiment was conducted with different treatments i.e. control (dry), control soaked (water), seed soaking (0.2% borax), seed soaking (0.5% $ZnSO_4$), foliar spray (water), foliar spray (0.2% borax), foliar spray (0.5% $ZnSO_4$), seed soaking + foliar spray (0.2% borax + 0.2% borax) and seed soaking + foliar spray (0.5% $ZnSO_4$ + 0.5% $ZnSO_4$) adopted randomized block design with three replications on widely used wheat variety KWR 108. Seed rate sown in 80 kg/ha was maintained with each treatment by weighting seed required for individual plot. The sowing was done in rows spaced 45 cm apart at depth of 5 cm as for as possible. A basal manuring of 20 kg N 40 kg P_2O_5 and 20 K_2O was applied uniformly in the form of the urea, DAP and muriate of potash. Freshly prepared solution of $ZnSO_4$ and borax were soaked and sprayed on foliage which was applied 25 and 65 DAS which coincide the stage of active tillering with the help of hand sprayer each plots as per treatment was sprayed with adequate solution to quick requirement of the plants. Three plants each plot were randomly selected and tagged for recording periodical growth observations. The sample were kept for recording of data partying to growth yield and chemical traits were removed from the plot at various stages and tagged separately. Quality parameters calculated by the formula as protein content (%) = nitrogen content (%) 5.95 the tagged sample was dried in the oven at 80-85C for hours to way to total dry.

Results and discussion

(A) Growth attributes

A critical examination (Table-1) results revealed that the treatment of seed soaking + foliar spray (@ 0.5% + 0.5% $ZnSO_4$) significantly appreciated the higher plant height at maturity stage (41.35cm) against control (35.90cm). Number of branches per plant application of seed soaking + foliar spray (@ 0.5% +0.5%. $ZnSO_4$) significantly higher in comparison to control (dry) varied significantly due to all stages of dry matter production/ plant. Leaf area index was higher in treatment of seed soaking + foliar spray (@0.5% $ZnSO_4$ +0.5% $ZnSO_4$) calculated significantly higher in all stages of leaf area index per plant in comparison to control (dry). It was also reported by Harishanker *et al.* (1999) that the results revealed that $ZnSO_4$ applied @ 30 kg/ha significantly increased growth attributes and similar results reported by Mehta *et al.* (2013), Verma *et al.* (2004) and Karam *et al.* (2013).

(B) Yields

Data (Table-2) indicated that the treatment of seed soaking foliar spray of $ZnSO_4$ @ 0.5% +0.5% $ZnSO_4$ produce significantly higher grain yield in comparison to treatment of control (dry). It was increased by a tune of 7.07 q/ha or 39.50% over control (dry) treatments. The treatment of seed soaking + foliar spray (@0.5% $ZnSO_4$ + 0.5% $ZnSO_4$) significantly influenced in respect to straw yield by 6.60 q/ha or 36.67% and harvest index by 7.11% than control (dry), respectively. The present findings are supported by Verma *et al.* (2015). Paramesh (2014) and Bhushan *et al.* (2003).

(C) Quality aspects:

The data presented (Table-2) vividly

evidence that maximum chlorophyll content mg/g of fresh weight was observed by the application of seed soaking + foliar application @ 0.5% $ZnSO_4$ + 0.5% $ZnSO_4$ (19.15%) at 55 days stages our rest of treatment, respectively. Protein content was significantly higher (24.39%) in application of seed soaking + foliar spray @ 0.5% $ZnSO_4$ + 0.5% $ZnSO_4$ treatment in comparison to control (dry) of 20.39%. The treatment in combination resulted in significantly higher net photosynthetic rates and concentration of chlorophyll, starch soluble protein and total free amino acids as well as nitrate reductase actively compared to control plants and both vegetative and flowering stages reported by Verma *et al.* (2004) and similar response of Ali and Mishra (2001).

(D) Economics:

Application of treatment (seed soaking+ foliar spray) @ 0.5% +0.5% of $ZnSO_4$ was a positive effect on economic yield but significant response which brought about higher yield. Statistically higher gross income was achieved in foliar spray @ 0.5% $ZnSO_4$ (Rs. 25572/ha or 171.05% than seed soaking in borax@ 0.5%. Net Profit was analyticaly higher in foliar spray @ 0.5% borax than seed soaking in borax @ 0.5% by a margin of Rs. 12117/ha or 115.95%. The treatment of foliar spray (@ 0.5% borax) had more cost benefit (1:6) ratio than seed soaking (@ 0.5% borax treatment. Similar observations were recorded by Verma *et al.* (2016.

Table 1: Effect of micronutrients on plant height (cm), number of branches/ plant leaf area index and dry matter/ plant (g) of chickpea (*cicer arietinum L.*) during 2015-16.

Treatment	Plant height (cm)	No. of branch per plant			Maturity	Leaf area index			Dry matter/ plant (g)			
		30 Days	60 Days	90 Days		30 Days	60 Days	90 Days	30 Days	60 Days	90 Days	Harvest
Control (dry)	35.90	1.45	5.60	11.65	11.75	84.65	115.95	174.13	0.99	4.24	16.10	29.25
Seed soaking in 0.2% borax	40.65	2.02	7.75	14.30	14.40	97.75	128.30	195.30	1.29	6.78	18.33	32.65
Seed soaking in 0.5% $ZnSO_4$	38.33	1.80	7.30	13.90	14.10	93.80	126.70	191.24	1.25	6.65	17.65	32.50
Foliar spray (water)	37.83	2.45	7.45	14.11	14.25	100.25	127.95	198.25	1.33	6.65	20.45	33.90
Foliar spray (0.2% borax)	40.10	1.50	6.45	12.97	12.05	85.50	116.25	176.10	1.11	5.15	17.95	31.70
Foliar spray (0.5% $ZnSO_4$)	38.60	2.70	8.10	14.45	14.60	106.33	138.49	195.24	1.34	6.90	22.15	34.75
Seed soaking + foliar spray	37.30	2.25	7.15	13.25	13.33	98.75	124.97	195.24	1.21	5.80	19.15	33.30
(0.2% borax + 0.2% borax)	40.15	2.55	8.30	14.20	14.70	106.65	137.11	199.25	1.35	6.99	20.25	34.80
(0.5% Zn + 0.5% Zn)	41.35	2.70	8.45	14.65	14.80	107.80	138.50	200.15	1.37	7.15	21.50	35.15
S.E.	**1.41**	**0.30**	**0.73**	**0.49**	**2.82**	**4.83**	**5.83**	**4.65**	**0.03**	**0.94**	**1.15**	**1.27**
CD at (5%) P -	**2.89**	**0.64**	**1.58**	**1.03**	**5.99**	**9.81**	**12.07**	**9.86**	**0.07**	**1.71**	**2.62**	**2.87**

Table 2: Effect of micronutrients on seed yield (q/ha), straw yield (q/ha), harvest index, cross income, net return, C.B. ratio Chlorophyll and Proteins (%) of chickpea (*cicer arietinum* L.) during 2015-16.

Treatments	Seed yield (q/ha)	Straw yield (q/ha)	HI %	Gross return	Net return	C:B ratio	Chlorophyll content (%) 55 Days	Protein content (%)
Control (dry)	17.90	18.00	43.44	14950	10450	1:3	13.65	20.39
Seed soaking in 0.2% borax	20.24	21.15	44.65	23594	19094	1:5	15.95	21.81
Seed soaking in 0.5% $ZnSO_4$	20.97	21.10	44.40	17514	13014	1:3	14.71	22.15
Foliar spray (water)	21.75	22.60	45.15	18191	13691	1:4	13.90	22.85
Foliar spray (0.2% borax)	20.12	19.50	47.95	16778	12278	1:5	18.95	20.50
Foliar spray (0.5% $ZnSO_4$)	23.75	23.05	48.25	27067	22567	1:6	17.15	23.20
Seed soaking + foliar spray	20.60	20.74	48.35	17205	12705	1:2	16.78	22.55
(0.2% borax + 0.2% borax)	23.15	23.24	49.85	19333	14833	1:4	18.92	23.35
(0.5% Zn + 0.5% Zn)	24.97	24.60	50.55	20837	16307	1:4	19.15	24.39
SE. (diff)	**0.94**	**0.94**	**0.91**	-	-	-	**0.47**	**0.93**
CD at (5%)	**2.01**	**2.00**	**1.94**	-	-	-	**0.99**	**1.87**

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