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EFFECT OF NUTRIENTS FOLIAR APPLICATION ON GROWTH AND YIELD OF CHICKPEA (*CICER ARIETINUM* L.)

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ABSTRACT

Foliar application of 2% urea and foliar application of nutrients at vegetative and pre flowering stage recorded significantly higher plant height, number of branches plant^{-1} and dry matter accumulation plant^{-1}. Yield attributing character *viz*. number of pods plant^{-1}, weight of pods plant^{-1}, grain yield plant^{-1} (g), grain yield, straw yield and biological yield (q ha^{-1}) were significantly higher with 2% urea spray and foliar application of nutrients at vegetative and pre-flowering stage.

Key words : Chickpea, Foliar application, Urea, KNO_3, Zinc.

Introduction

It is important to increase the production potential of all the pulse crops to meet the ever-increasing demand. Foliar fertilization of pulses during the seed development stage had received considerable attention to increase their seed production. The efficiency of nutrient uptake through foliar spray is considered to be greater than soil application of nutrients particularly when the soil moisture is poor. The crop plants can easily absorb and assimilate chemicals when applied through foliar spray. Urea is one of the most widely used foliar N-fertilizers, characterized by high leaf penetration rate, low cost and most plants can absorb it rapidly and hydrolyse in the cytosol (Witte *et al.*, 2002). thus, foliar spray of urea could directly affect N metabolism under stressful conditions and therefore amino acids synthesis. Potassium is a key nutrient in the plant's tolerance to stress such as high/low temperatures, drought, disease and pest occurrences. It influences the water economy and crop growth through its effects on water uptake, root growth, maintenance of turgor, transpiration and stomatal regulation (Nelson, 1980). Its essentiality is proven in its multiple roles in assisting and facilitating plant process. Thus, the present study was conducted to evaluate the effect of nutrients foliar application on growth and yield of chickpea. In India, zinc (Zn) is considered as fourth most important yield limiting nutrient in agricultural crops. Zinc plays an important role in plant reproductive development for initiation of flowering, floral development, male and female gametogenesis, fertilization and seed development.

Materials and Methods

A field experiment was carried out at Agronomy Section Farm, College of Agriculture, Nagpur during *rabi* season to study the effect of foliar application of nutrients on growth and yield of chickpea. The soil of experimental plot was medium black, clayey in texture, containing 0.50 % organic carbon, low in available nitrogen (260 kg ha^{-1}), phosphorus (19.25 kg ha^{-1}) and medium available potash (371 kg ha^{-1}) with a pH of 7.7. Chickpea variety Jaki-9218 was selected for the study. The experiment was laid out in a factorial randomized block design with 12 treatment combinations consisted of four foliar sprays [Water spray Control (F_1), 1% KNO3 (F_2), 2% urea (F_3), 0.5% zinc (F_4)] at three growth stages [vegetative (S_1), pre-flowering (S_2) and vegetative + pre-flowering stage (S_3)] replicated thrice. The seeds were treated with Carbendazim @ 4 g kg^{-1} seeds and drilled at a spacing of

30 × 10 cm. The recommended dose of fertilizer 25:50:00 kg NPK ha^{-1} of was applied in the form of urea and single super phosphate, respectively as soil application at the time of sowing.

Results and Discussion

Growth attributes

Data revealed that, plant height at 30 DAS was not significantly affected due to various treatments. Plant height at 60, 90 DAS and at harvest was 39.16 cm, 50.71 cm and 54.29 cm respectively with 2% urea spray (F_3) at vegetative + pre-flowering stage was found significantly superior over all other treatments. This might be due to timely availability of nitrogen at the time of its demand. Similar results were also obtained by Atram (2007). They reported that 2% urea spray at flower initiation stage and 10 days thereafter recorded maximum plant height (44.7 cm).

The effect of foliar application of nutrients on number of branches $plant^{-1}$ was found to be significant at 60, 90 DAS and at harvest except at 30 DAS. The highest number of branches $plant^{-1}$ was recorded with 2 % urea spray at vegetative + pre-flowering stage (8.13, 10.13, and 10.22) at 60, 90 DAS and at harvest. The increase in number of branches might be due to ready availability of nitrogen, which might have avoided the apical dominance and resulted into increased branching. These results found confirmation with Parimala *et al*. (2013). They reported that DAP 2% and urea 2% spray recorded significantly a greater number of branches per plant.

The dry matter production at various growth stages clearly indicated that there is a gradual increase in dry matter production with duration of the crop. The highest dry matter production $plant^{-1}$ was recorded with 2% urea spray at vegetative + pre-flowering stage (23.51, 34.36, and 38.80 (g)) at 60, 90 DAS and at harvest which was significantly superior over all other treatments. Increased total dry matter at harvest was mainly due to additional foliar application nutrients which led to increased uptake of nutrients which in turn helped in increased plant height and number of branches. This contributed for better plant growth and ultimately increased the dry matter production. These results are confirmation with the findings of Bodhade (2007). He reported that foliar spray of 2% urea at flower initiation and pod formation stage increase the dry matter accumulation $plant^{-1}$.

Yield attributes

Data given in Table 1 revealed that foliar spray of 2% urea (F_3) at vegetative + pre-flowering stage produced significantly highest number of pods $plant^{-1}$ (73.56) and was significantly superior over other treatments. Foliar spray of 1% KNO_3 (69.06) and 0.5% zinc spray (67.31), being at par with each other, were significantly superior over control (61.89). Foliar spray of urea at the commencement of flowering stage might have helped in reducing flower drop and contributed more for reproductive organs such as stamens and pollen. Stamen's activity enhances the number of flowers that can fertilize well resulting in increased number of pods $plant^{-1}$. Similar results were obtained by Atram (2007), Tanwar *et al*. (2014). They reported that foliar application of 2% urea solution at flower initiation stage and 10 days thereafter significantly improved the pods $plant^{-1}$.

Foliar spray of nutrients significantly influenced the weight of pods $plant^{-1}$. From the Table, it was recorded that the weight of pods $plant^{-1}$ were significantly highest with foliar application of 2% urea (F_3) (28.23 g). It appears that nitrogen through foliar application of urea might have been effectively absorbed by chickpea and translocated more efficiently to developing pods for proper filling of grains which might have resulted into increased weight of pods $plant^{-1}$. Foliar spray of different nutrients did not show any significant influenced on 100 seed weight of chickpea. Highest 100 seed weight recorded in 2% urea spray. Significantly highest grain yield $plant^{-1}$ was obtained with 2% urea spray (26.87 g). It was followed by 1% KNO_3 spray (24.20 g) and 0.5% zinc spray (23.23 g). Both being at par with each other, proved significantly superior over water spray (19.04 g). The increase in grain yield $plant^{-1}$ could be attributed to corresponding increase in number of pods $plant^{-1}$ and weight of pods $plant^{-1}$ obtained due to increased availability of nitrogen through foliar application. Similar results were obtained by Atram (2007) and Bodhade (2007).

Grain, straw and biological yield (q ha^{-1}) was significantly influenced due to foliar spray of different nutrients. Significantly highest grain, straw and biological yield was observed with 2% urea spray (19.23, 36.54 and 55.77 q ha^{-1}) at vegetative + pre-flowering stage. It was followed by 1% KNO_3 spray (17.33 q ha^{-1}) and 0.5% zinc (17.13 q ha^{-1}). Increase in grain yield of chickpea due to foliar application of nitrogen might be due to increased growth parameters *viz*. plant height, number of branches $plant^{-1}$ and dry matter accumulation $plant^{-1}$ which ultimately resulted into increased yield parameter *viz.* number of pods $plant^{-1}$, weight of pods $plant^{-1}$ and grain yield $plant^{-1}$. Similar result was observed by Bhowmick *et al.* (2013), Tanwar *et al.* (2014) and Goud *et al*. (2014). They reported that foliar application of 2% urea at vegetative + pre-flowering stage gives highest grain, straw and biological yield q ha^{-1}.

Table 1 : Growth attributes and Yield attributes of chickpea as influenced by different treatments.

Treatments	Mean plant height (cm)	No. of branches plant^{-1}	Dry matter accumulation plant^{-1} (g)	No. of pods plant^{-1}	Weight of pods plant^{-1} (g)	Grain yield plant^{-1} (g)	Grain yield q ha^{-1}	Straw yield q ha^{-1}	Biological yield q ha^{-1}
A. Nutrient foliar application									
F_1- Control (water spray)	42.56	8.42	32.21	61.89	20.78	19.04	15.02	22.53	37.55
F_2- 1% KNO_3	52.67	9.64	35.91	69.06	25.88	24.20	17.33	29.46	46.79
F_3- 2% Urea	54.29	10.22	38.80	73.56	28.23	26.87	19.23	36.54	55.77
F_4- 0.5% Zinc	51.60	9.38	35.28	67.31	25.03	23.23	17.13	27.41	44.54
SE(m)±	0.39	0.09	0.33	1.10	0.33	0.38	0.59	0.97	1.55
CD at 5%	1.14	0.28	0.98	3.23	0.97	1.12	1.72	2.84	4.55
B. Growth stages									
S_1- Vegetative stage	47.98	9.02	33.79	63.54	22.49	20.92	15.10	25.51	40.61
S_2- Pre-flowering stage	50.38	9.45	35.58	68.09	25.41	23.73	17.00	28.74	45.74
S_3-Vegetative and pre flowering stage	52.47	9.78	37.28	72.23	27.04	25.36	19.43	32.69	52.12
SE(m)±	0.34	0.08	0.29	0.95	0.29	0.33	0.51	0.84	1.34
CD at 5%	0.98	0.24	0.85	2.80	0.84	0.97	1.49	2.46	3.94
Interaction (F×S)									
SE(m)±	0.67	0.16	0.58	1.91	0.58	0.66	1.02	1.68	2.69
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS
G.M.	50.28	9.41	35.55	68.00	25.08	23.30	17.18	28.98	46.16

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