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Influence of hydrogel and foliar nutrition on chickpea under rainfed conditions of Manipur

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Abstract
A field experiment was conducted over two consecutive winter seasons, 2018-19 and 2019-20, to improve crop and water productivity in chickpea through hydrogel and foliar nutrition under rainfed conditions. The experiment was laid out in a split plot design with three replications. In the main plots, there were two hydrogel levels (control and 5 kg/ha before sowing) and five foliar nutrition levels at flowering initiation and pod development stages (control, urea 2%, thiourea 500 ppm, salicyclic acid 100 ppm, and NPK (19:19:19) at 0.5%) in the subplots, together comprising of ten treatment combinations. The pooled mean data from 2018-19 to 2019-20 revealed that, while applying hydrogel at 5 kg/ha before sowing had no influence on yield, it did result in higher biological yield than the control. Foliar nutrition application during flower initiation and pod development stages increased the dry matter production, resulting in higher chickpea seed yield. Thiourea application resulted in enhancing water use efficiency compared to other treatments.

Keywords: Influence, foliar, nutrition, chickpea, rainfed

Introduction
Chickpea (*Cicer arietinum* L.), a staple of the Indian vegetarian diet, is regarded as one of the most significant pulses in the country. This crop is also an important component of diversified and intensive cropping systems that contribute to long-term agricultural production. Despite its numerous advantages, its productivity is limited due to a variety of biotic and abiotic factors. Insufficient soil moisture is the most common environmental stress in dryland locations around the world. Because there is minimal scope for extra irrigation, chickpea is generally cultivated as a rainfed crop on retained soil moisture. Thus, one of the biggest impediments to increasing/sustaining chickpea yield is a lack of water. Heat and temperature extremes in crop developmental stages particularly flowering and pod development amid moisture stress are key variables affecting chickpea productivity due to flower drop and seed filling.

Super absorbent polymers, such as hydrogel, may offer significant promise in soil renewal and reclamation, as well as in conserving readily available water for plant growth and development by delaying the permanent wilting point and reducing crop irrigation requirements. Hydrogels have enormous potential and can boost the water availability during the crop growth phase in places with very limited irrigation opportunities. According to Singh *et al*. (2016) [5], this can absorb and hold water up to 80–180 times its original volume, while it can absorb up to 400 times its original weight. By decreasing the crop's need for irrigation, the application of hydrogel delays the permanent wilting point (Shooshtarian *et al*. 2012) [6].

Foliar nutrition with bio-regulators and nutrient sprays may be a viable option for increasing photosynthetic efficiency, assimilate partitioning, and growth and yield. The primary factors affecting the productivity of *rabi* pulses are heat and temperature extremes during crop developmental stages (particularly blooming and pod development during moisture stress). These conditions cause flower drop and seed filling. The reduction in photosynthetic activity brought on by a nitrogen scarcity in plants speeds up the senescence of leaves, which is crucial for encouraging subsequent phases of pod development, which depend on carbon and nitrogen accumulation. In addition to higher expenses, providing nitrogen through soil may also result in roots' reduced ability to absorb nutrients when it's dry (Ram *et al*., 2018) [4]. As a result, providing nutrients via foliar application using bio-regulators in a lower concentration aids in nutrient uptake by serving as a chemical catalyst in plants to improve physiological and reproductive efficiency (Davies *et al*., 2000) [1].

As a result, an experiment was carried out to improve the nutrient and water use efficiency of chickpea through hydrogel and foliar nutrition on chickpea growth and yield under limited irrigation conditions.

Materials and Methods

The field experiment was conducted over two consecutive winter seasons, 2018-19 and 2019-20, at Research Farm, Andro, Central Agricultural University, Imphal, which is located between 24°76 North latitude and 94°05 East longitude at a height of 900 meters above mean sea level (MSL) in Imphal East district of Manipur. The soil at the experimental site had the texture of clayey loam, was acidic in soil reaction, high in organic carbon, medium in available nitrogen, low in available phosphorus, and high in available potassium. The climate at the experimental site is subtropical. The experiment was laid out in a split plot design with three replications. In the main plots, there were two hydrogel levels (control and 5 kg/ha before sowing) and five foliar nutrition levels at flowering initiation and pod development stages (control, urea 2%, thiourea 500 ppm, salicyclic acid 100 ppm, and NPK (19:19:19) at 0.5%) in the subplots, together comprising of ten treatment combinations. One deep ploughing, two harrowings, and two passes with a land leveller were used to prepare the field. During both years of study, chickpea var. GJG0809 was sown during first fortnight of November with a crop geometry of 30x10 cm. Crop was raised under limited irrigated condition and one pre-sowing irrigation was applied. Crop received 113.6 mm and 127.4 mm rainfall during the first year and second year, respectively. A common dose of N: P_2O_5:K_20 @20:40:20 kg/ha was given in all the treatments. The data were analyzed statistically by the method of analysis of variance as per the procedure outlined for the split-plot design (Gomez and Gomez, 1984) [2]. Statistical significance was tested by F value at 0.05 level of probability and the critical difference was worked out wherever the effects were significant.

Results and Discussion

Effect of hydrogel application on growth and yield components

Results revealed that hydrogel application at 5 kg/ha before sowing had significant effect only on dry matter production and biological yield. There was 7.5% increase in biological yield due to application of hydrogel over the control. However, application of hydrogel had no effect on plant growth, yield attributes and yield of the chickpea. Hydrogel application also improved consumptive use of moisture by the crop over no hydrogel application, though the result was insignificant. The increase in water use efficiency might be due to higher grain yield under hydrogel application. Higher water use efficiency under application of hydrogel was also reported by Kumar and Rajkumara (2016) [3] (Table 1).

Effect of foliar nutrition

Foliar nutrition had a significant impact on chickpea crop yield and yield-related characteristics in both years compared to control. The examined yield-related characteristics for both years were significantly enhanced by the treatment of urea 2%, thiourea at 500 ppm, salicylic acid at 100 ppm, and NPK 19:19:19 at 2%. Thiourea 500 ppm application increased chickpea production by 34.9% in comparison to control (water spray), even though yield enhancement owing to application of urea 2%, salicylic acid at 100 ppm, and NPK 19:19:19 at 2% only ranged from 13.8-15.4% (Table 2). This may be because foliar applications of nutritional substances and plant growth regulators led to an increase in dry matter production and seed weight, which in turn increased yield. According to Sharma and Dey (1986), foliar applications of nutrients or plant growth regulators can both increase the retention of flowers and pods.

Table 1: Effect of hydrogel and foliar nutrition on growth and yield attributes of chickpea

Treatment	Plant Height (cm)	Dry matter production /plant	Pods/ plant	100 seeds weight (g)	Seeds/ pod
Hydrogel Application before sowing					
No Hydrogel	35.20	15.84	24.21	27.56	1.3
Hydrogel (5kg/ha)	37.09	15.91	24.91	26.95	1.4
S.Em(±)	0.40	0.25	0.71	0.28	0.24
CD .05	NS	NS	NS	NS	NS
Foliar Nutrition					
Water Spray	39.07	12.79	25.47	27.07	1.3
Urea 2%	35.17	15.30	23.43	28.72	1.5
Thiourea 500 ppm	35.17	19.41	23.73	27.21	1.5
Salicylic acid 100 ppm	34.33	15.46	27.47	26.92	1.3
NPK (19:19:19) (0.5%)	37.00	16.40	22.70	26.37	1.0
S.Em(±)	0.75	0.52	1.29	0.28	0.15
CD .05	2.26	1.56	NS	0.83	NS

Table 2: Effect of hydrogel and foliar nutrition on yield and moisture use efficiency in chickpea

Hydrogel Application before sowing	Seed yield(kg/ha)	Biological yield (kg/ha)	Moisture use efficiency (kg/ha-mm)
No Hydrogel	1253.90	2121.17	4.46
Hydrogel (5kg/ha)	1188.26	2294.75	5.65
S.Em(±)	20.62	23.73	0.23
CD .05	NS	144.39	NS
Foliar Nutrition			
Water Spray	1010.86	1668.50	4.69
Urea 2%	1194.88	1823.56	4.57
Thiourea 500 ppm	1553.09	2681.21	5.83
Salicylic acid 100 ppm	1163.02	2176.16	5.12
NPK (19:19:19) (0.5%)	1183.56	2690.36	5.08
S.Em(±)	65.07	69.11	0.26
CD .05	195.05	207.15	0.77

Conclusion

The subtropical agro-climate of Manipur, India, may not benefit from the use of hydrogel prior to the seeding of chickpea crops, according to the data from these two years. To increase crop and water production and profitability, salicylic acid supplementation at 100 ppm or foliar thiourea treatment at 500 ppm may be applied during the flowering and pod development stages.

References

1. Davies SL, Turner NC, Palta JA, Siddique KHM, Plummer JA. Remobilization of carbon and nitrogen supports seed filling in desi and Kabuli chickpea subject to water deficit. Aust. J Agri. Res. 2000;51:855-866.
2. Gomez KA, Gomez AA. Statistical Procedures for Agricultural Research. John Wiley & Sons; c1984.
3. Kumar PHM, Rajkumara S. Effect of irrigation and hydrogel application on chickpea varieties in Malaprabha Command area. J Farm Sci. 2016;29:208-211.
4. Ram B, Punia SS, Tetarwal JP, Meena DS, Singh P,

Chaudhary HR. Effect of Hydrogel and Foliar nutrition sprays on productivity and profitability of lentil under rainfed situation of south eastern plain zone of Rajasthan. Int. J Adv. Sci. Res. Manag. 2018;1:67-70.
5. Singh NP, Praharaj CS, Sandhu JS. Utilizing untapped potential of rice fallow of East and North-east India through pulse production. Indian J Genet. 2016;76:388-398.
6. Shooshtarian S, Abedi KJ, Tehrani FA. Evaluation of application of super absorbent polymers in green space of arid and semi-arid regions with emphasis on Iran. Int. J for Soil Eros. 2012;2:24-36.