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Chickpea (*Cicer arietinum*) soil chemical attributes after urea, potassium sulphate and super phosphate fertilization at Shahdol district (M.P.)

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Abstract
Chickpea is among the most significant food legumes that are used as a source of food and feed, cash income for farmers, and in sustaining soil fertility. Various studies on the integrated use of P rate and rhizobium inoculation under varied situations showed substantial effects (enhanced nodulation, growth, yield, and its attributes) over the separate use of P rate or rhizobium inoculation. The experiment it is clear that in experimental sets with 0.2% of urea, potassium sulphate and super phosphate the average height of plant species *Cicer arietinum* increased as compared to their control sets but in another sets with 0.4% to 0.6% urea the average height of the plants was found to have decreased. The potassium sulphate was not effective but super phosphate shows earlier good results.

Keywords: urea, potassium sulphate, super phosphate, chickpea, soil, Shahdol

1. Introduction

Chickpea (*Cicer arietinum* L.) is the third most cultivated legume in the world. India stands out as one of the largest producers and consumers of its seeds (or seed); however, its production is insufficient to meet the needs of the internal market, and chickpea imported (Bidyarani *et al*., 2016) [1].

Phosphorus fertilization is among the main practices of crop management; yet, it is considered complex in tropical soils because of the high capacity of phosphorus for covalent adsorption to soil oxides (Gazola *et al*., 2013) [2] and because of low natural availability of P to plants.

chickpea, balanced phosphorus nutrition is fundamental for establishing symbiosis with N2 fixing rhizobacteria, and it stimulates nodulation, initial development of roots, plant growth, and seed yield and quality, among other aspects (Balai *et al.*, 2017) [3]. Neenu *et al.* (2014) [4] affirm that fertilization with 60 kg ha-1of P_2O_5 is sufficient for maximum production of chickpea seeds in a Vertisols in India. Das *et al*. (2008) [5] also reported a positive effect on relative growth rate, dry matter accumulation, nodulation, yield, and harvest index with application of 60 kg ha-1 of P_2O_5. Economical efficiency and high degree of protein are reported by Singh and Singh (2012) [6] using this same phosphorus application rate.

Phosphate fertilization, together with other nutrients such as molybdenum (Mo), can maximize legume yield. Bhuiyan *et al.* (2008) [7] and Togay, Togay and Dogan (2008a)[8] obtained maximum seed yield and aboveground biomass production of mung bean and lentils, respectively, after using phosphorus application rates associated with molybdenum fertilization.

2. Material and Methods

Fertilizer solutions had been prepared using a definite amount of fertilizer i.e. each of 0.2, 0.4 and 0.6 percent by weight dissolved in distilled water. Healthy seeds of *Cicer arietinum* selected and soaked separately in the fertilizer solutions i.e. each of 0.2, 0.4 and 0.6 percent of urea, potassium sulphate and super-phosphate with the control sets for 24 hours 20 ml of each solution mentioned above was used to soak the filter paper in each of the neat and clean petridish.

3. Results and Discussion

The 10 days old plants of *Cicer aritinum* also shows positive results during the treatment of various fertilizers solution. In low concentration i.e. 0.2% the sugar, non sugar and protein values are observed highest in comparison to control. The 0.2% of urea treatment shows 4.8% sugar, 13.51 mg non sugar and 4.04 mg. of protein. While fat shows 0.99 mg which is similar to control and Chl a 389 mg and Chl b 141 mg which are less than control. If the concentration increased 0.4% and 0.6% the values of sugar, non sugar and proteins are decreased. The potassium sulphate solution treated plants are shows some trend. But 0.2% super phosphate treatment shows low values of sugar and non sugar. The fat shows 0.99 mg which similar to control but Chl a (389 mg) and Chl b (141 mg) both are showing lesser value in comparison of control. If concentration of solution are increased the values of sugar, non sugar and proteins are increased but the value of fats, Chl a and Chl b are decreased.

Analysis of 20 days old plants of *Cicer aeritinum* which were treated with urea, 0.2% to 0.6% the sugar, non sugar and protein enhanced white fat, chl a and chl b decreased. Likewise potassium sulphate and super phosphate treatment the values of sugar, non sugar, protein, fats, chl a and chl b shows moderate results.

The 30-days old plants of *Cicer aeritinum* exhibited decrease in non-sugar and protein along with increase in the concentration of potassium sulphate from 0.2% to 0.6%, while the amount of sugar increased from 4.6 mg. to 4.7 mg. The protein, chl a and chl b shows lesser amount.

Table 1: Analysis of 10 day old plants of *Cicer arietinum* (per 100 gm.)

Name % percentage of the fertilizer		Sugar	Non-sugar	Protein	Fat	Chl-a (mg)	Chl-b (mg)
Urea	0.2	4.8	13.51	4.04	0.99	389	141
	0.4	4.4	12.50	4.03	0.82	382	138
	0.6	4.3	12.34	2.02	0.80	380	136
	r	-0.94	-0.94	-0.86	-0.73	0.36	0.69
	SD	±0.26	±0.62	±1.16	±0.09	±5.57	±3.61
Potassium sulphate	0.2	4.7	12.34	4.05	1.09	442	149
	0.4	4.6	10.17	4.04	1.01	440	143
	0.6	4.5	10.11	4.03	0.89	437	140
	r	-1	-0.87	-0.87	-0.99	0.35	-0.33
	SD	±0.10	±1.27	±0.59	±0.10	±7.09	±3.06
Super phosphate	0.2	5.5	15.70	4.01	0.87	415	138
	0.4	5.6	15.72	3.98	0.93	410	137
	0.6	5.3	16.81	3.39	0.98	410	130
	r	-0.65	0.87	-0.88	0.99	-0.76	-0.92
	SD	±0.15	±0.64	±0.35	±0.06	±2.65	±4.36
Control		3.81	9.03	3.82	0.99	456	153

Table 2: Analysis of 20 day old plants of *Cicer arietinum* (per 100 gm.)

Name % percentage of the fertilizer		Sugar	Non-sugar	Protein	Fat	Chl-a (mg)	Chl-b (mg)
Urea	0.2	4.51	12.35	3.03	0.97	454	153
	0.4	4.32	11.23	2.26	0.83	447	147
	0.6	4.27	11.23	2.03	0.80	440	141
	r	-0.94	-0.86	-0.95	-0.93	-0.43	-1.00
	SD	±0.13	±0.65	±0.52	±0.09	±3.51	±6.00
Potassium sulphate	0.2	4.26	11.24	3.91	1.03	430	130
	0.4	4.09	10.11	3.90	1.01	429	137
	0.6	4.09	10.10	3.81	1.00	428	121
	r	-0.86	-0.85	-0.90	0.74	-0.66	0.13
	SD	±0.10	±0.65	±0.06	±0.05	±1.53	±3.79
Super phosphate	0.2	5.03	13.49	3.97	0.95	410	120
	0.4	5.00	13.47	4.01	1.00	409	118
	0.6	5.00	13.20	4.08	1.00	408	115
	r	0.65	0.85	0.98	0.99	0.99	0.99
	SD	±0.05	±0.42	±0.06	±0.06	±4.04	±3.51
Control		4.11	11.23	3.50	0.99	430	153

Table 3: Analysis of 30 day old plants of *Cicer arietinum* (per 100 gm.)

Name % percentage of the fertilizer		Sugar	Non-sugar	Protein	Fat	Chl-a (mg)	Chl-b (mg)
Urea	0.2	3.18	9.03	4.50	1.03	522	177
	0.4	3.03	7.82	4.50	1.09	521	170
	0.6	3.00	7.78	3.46	1.11	520	170
	r	-0.93	-0.88	-0.83	0.96	0.81	-0.79
	SD	±0.10	±0.71	±0.62	±0.04	±4.93	±3.79
Potassium sulphate	0.2	3.27	9.03	4.87	1.16	555	132
	0.4	3.21	9.00	4.87	1.00	553	130
	0.6	3.11	7.78	4.77	0.98	550	125
	r	-0.75	-0.86	-0.86	-0.5	-0.99	0.72
	SD	±0.11	±0.72	±0.06	0.08	±2.52	±2.08

Super phosphate	0.2	3.49	10.09	5.06	1.13	495	110
	0.4	3.99	10.11	5.13	1.00	488	104
	0.6	4.03	11.23	5.21	0.99	483	102
	r	0.89	0.87	0.99	-0.89	-0.99	0.69
	SD	±0.30	±0.65	±0.08	±0.08	±6.03	±7.21
Control		3.11	10.15	4.02	0.99	550	170

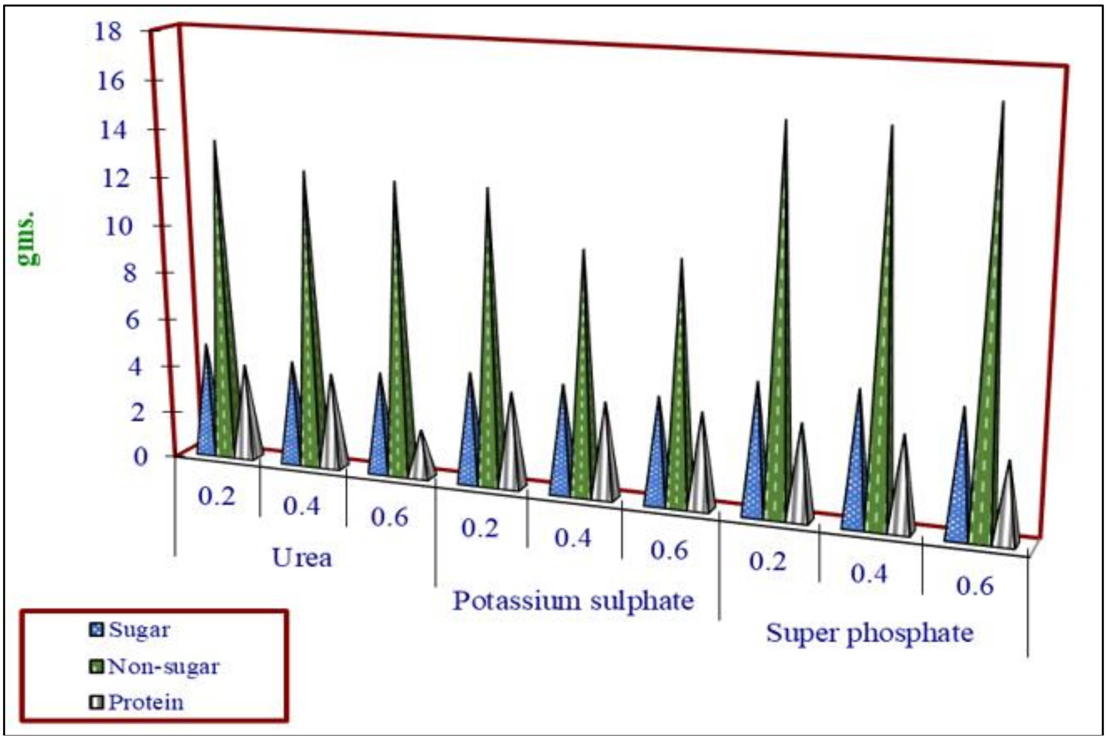

Fig 1: Analysis of 10 day old plants of Cicer arietinum (per 100 gin.)

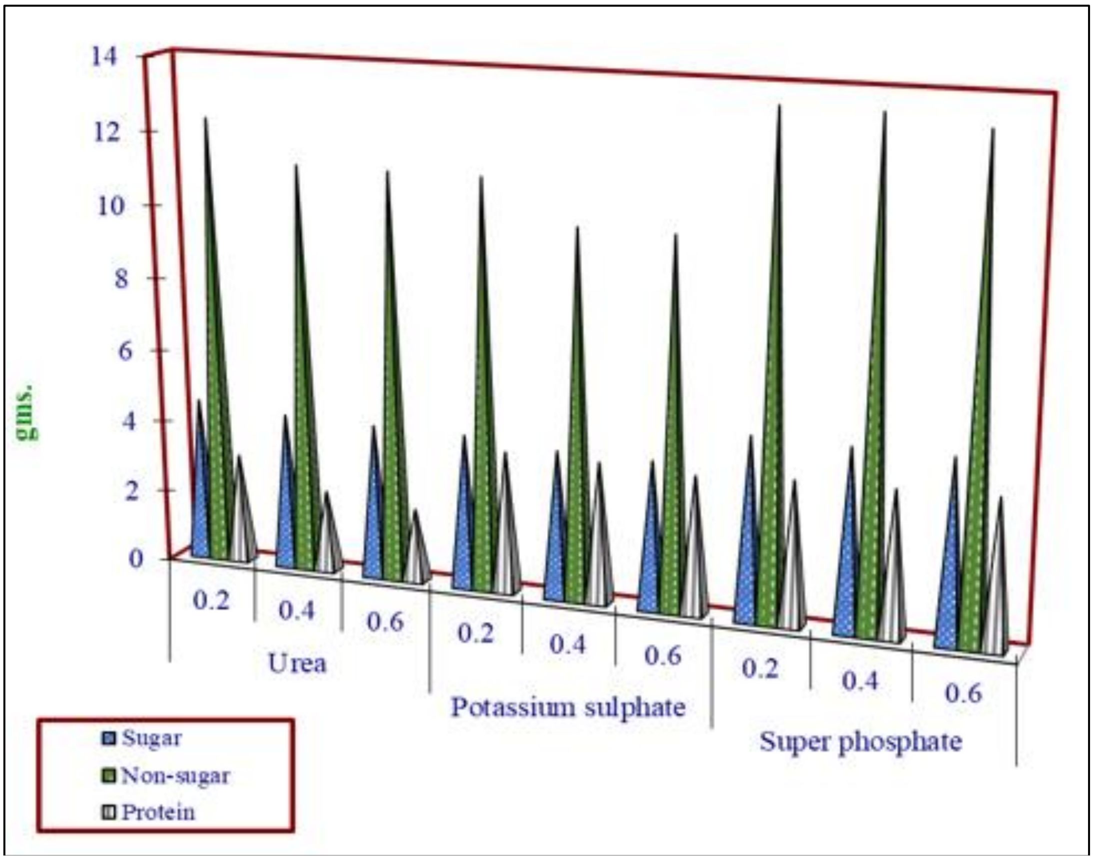

Fig 2: Analysis of 20day old plants of Cicer arietinum (per 100 gm.)

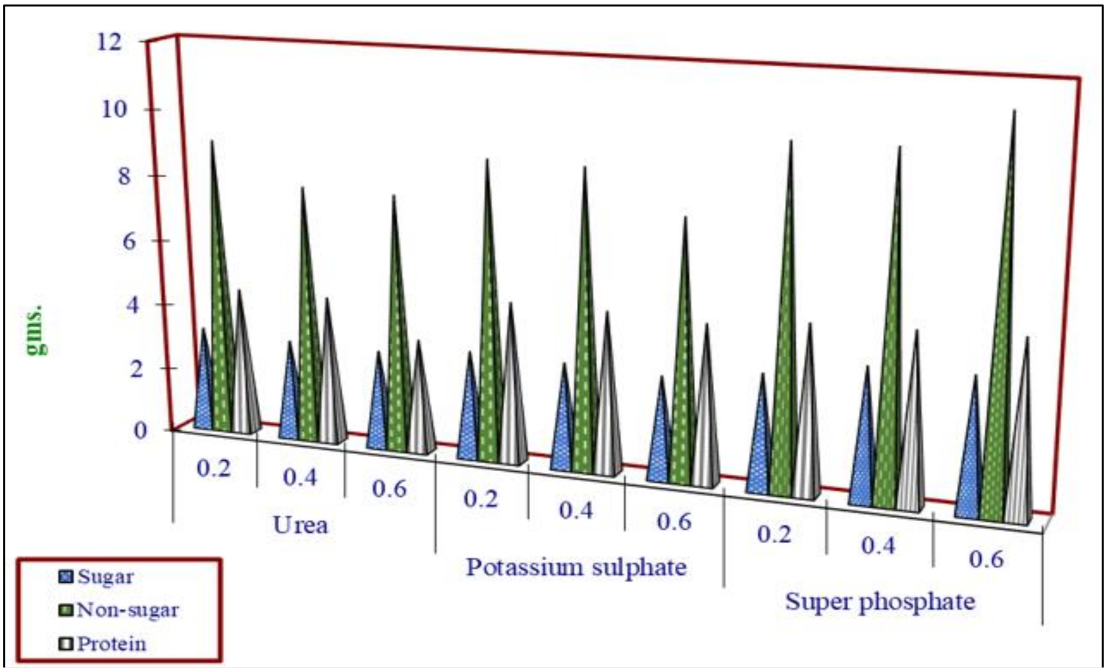

Fig 3: Analysis of 30 day old plants of *Cicer arietinum* (per 100 gm.)

Apart from stimulatory compounds, substances inhibitory to the growth of roots and the production of root-hairier secretes by some organisms and these may cause a considerable reduction in nutrient uptake, Bowen and Rovira (1961) [9]. Growth of the plants will be influenced by the secretion of metabolically active compounds and by the breakdown of minerals. Welte *et al.* (1962, 1966) [10, 11] had shown that when nutrients were readily available, addition of soil micro-organisms to red clover, growing in nutrient culture, generally caused stunned roots.

On the other hand, when nutrients were supplied as in-soluble compounds, there was an indirect growth promoting effect through microbial decomposition of the mineral salts.

In general, P2 O5 application rates from 150 to 200 kg ha-1 made it possible to obtain high agronomic indices in chickpea. Neenu *et al.* (2014) [4] found that when they applied 90 kg ha-1 P2 O5 on a Vertisols, P uptake by seeds was high, corroborating data of Singh and Singh (2012) [6]. Togay *et al.* (2008b) [12] also evaluated the response of chickpea under P application rates and found rates lower than those reported in the present study, perhaps because this study works with tropical soils, and phosphorus is more adsorbed to clay complexes. Results may also be related to the level of technology and the cultivar used by the authors.

4. Conclusion

In conclusion, we found different responses from wheat germination and seedling growth under fertilizer applications. Reduction in plant-growth may be due to a high salt content around the roots of the plants as it markedly reduces their power of absorbing water. Due to this factor plant water-stress occurs, whenever the loss of water in transpiration exceeds the rate of absorption. The high concentration of salt reduces the osmotic potential of the cell sap and due to it cell water potential is kept low.

5. References

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