CONTEMPORARY RESEARCH IN INDIA
ISSN 2231 - 2137

EFFECT OF FOLIAR APPLICATION OF NUTRIENTS ON GRAIN, STRAW YIELD AND SOIL FERTILITY STATUS AFTER HARVEST OF CHICKPEA

Bhosale Prerana, Gethe R. M., Gaikwad D. D., Anarse S. A. and Harer P. N.

AICRP on Agroforestry, Mahatma Phule Krishi Vidyapeeth, Rahuri

Received: 19/08/2017 | **Edited: 24/08/2017** | **Accepted: 29/08/2017**

Abstract: *The field experiment was conducted in the Pulses Improvement Project MPKV, Rahuri, Dist. Ahmednagar during 2007-08 to 2011-12. Study the "Effect of foliar application of nutrients on grain, straw yield and soil fertility status after harvest of chickpea "The experiment was let out in randomized block design with three replication. T_1- Absolute control, T_2- Water sprays, T_3-KNO_3 0.5%, T_4- KNO_3-1.0%, T_5- KNO_3-1.5%, T_6- KNO_3-2%, T_7-urea-2%, T_8-DAP-2%. Application of 2% KNO_3 gave significantly higher grain yield (2275kgha^{-1}), which was followed by the treatments T_5 (1968 kgha^{-1}). In case of straw yield the application of 2% KNO_3 gave significantly higher straw yield (3094 kgha^{-1}).which was followed by T_5. (2705kgha^{-1}). As chickpea being long day plant, any delay in flowering would facilitate more dry matter production.So foliar application of potassium nitrate contributed in dry matter production (upto some extent) as indicated by delayed flowering also. The data revealed that highest organic carbon (0.59%), available nitrogen (228.4 kgha^{-1}), phosphorus (16.31 kgha^{-1}), available potassium (448.6 kgha^{-1}), was due to T_6. treatments i.e. 2% KNO_3 as compared to other treatment.*

Key Words: *Potassium nitrate, Chickpea, Yield.*

Introduction

Chickpea is a grain legume crop grown primarily for its nutritional value. Because of high protein content, it is considered as an economical source of quality vegetable protein in human diet. Farmers have a wrong notion that chickpea being a legume crop, dose not need any nutrition and usually grow it on the marginal lands, without applying any fertilizers. The yield gap of chickpea maybe attributed to improve agro-technology used by the farmers. Yield gap can be abridged, by adopting the advanced production technology accompany with use of inoculums, balanced nutrition, weed management and high yielding varieties Hakoomat et al (2004). Low organic matter content in the soil is one of the major cause of the deficiency of nutrients Ahmed et al, (1998). It is established that potassium is essential for N and carbohydrate metabolism, activation of varies enzymes and adjustment of stomatal movement and water relations. Due attention towards nutrients management is not paid in case of low input high risk rain fed legume crops, frequently grown in low fertility soils.(Halliday,1992). To maintain or improve the fertility of soil, the supplies must compensate what was exported at the harvest time.

The potassium is known by its influence many enzymatic reactions and is associated with almost very major plant function. It improves the efficiency of plant water and sugar use for maintenance and normal growth function. Potassium works with phosphorus to stimulate and maintain rapid root growth of plant. Moreover, the lack, of moisture in the soil during the growing period could limit K uptake by roots K is easily adsorbed and distributed through leaf tissue.

The foliar application of nutrients to the crop plant is essential to correct the nutritional disorder. Early time, application of micro nutrients was not tried on large scale, but today with rapid development of efficient spraying equipments and availability of various form of highly water soluble fertilizers. The practice of foliar feeding of nutrients has spread up to economize the quantity of nutrient elements used as a solid through soil. Foliar feeding overcomes the deficiency of these nutrients. Which

are not available to plant due to unfavorable condition of the soil. Thus, the application of nutrients spray has become a commercial feasibility for efficient crop production. All nutrients that are taken by root can also be taken by leaves stem and fruits.

The aim of the this experiment was to investigate of the effect of foliar application with potassium nitrate and other nutrients on grain and straw yield and soil fertility status after harvest a chickpea.

Materials and Methods

A field experiment was conducted in the Pulses Improvement Project, MPKV, Rahuri, dist. Ahmednagar during 2008-2009 to 2011-2012 to study the "Effect of foliar application of nutrients on grain straw yield and soil fertility status after harvest of chickpea". The soil of the experiment field was mediumblack and fairly drained the textural class was clayey. The chemical composition indicated that the soil was low in organic carbon (0.39%), low in available nitrogen (191.2 kg ha^{-1}), low in available phosphorus (12.18 kg ha^{-1}) and very high in available potassium (418.8 kg ha^{-1}).The soil was alkaline in reaction (8.61). The experiment was laid out in randomized block design with three replication. T_1- absolute control, T_2-water spray, T_3 - KNO_3 0 .5 %, T_4-KNO_3 1 %. T_5- $KNO_{31.5}$%, T_6-KNO_3 2 %, T_7- Urea 2 %, T_8– DAP 2%. Chickpea seeds were treated with carrier based Rhizobium and PSB each at the rate of 205 g per kg seed and mixed well to ensure the inoculum to stick on to the surface of the seeds. The treated seeds were dried in shade for an hour and used for sowing. A fertilizer dose of N @ of 25 kg ha^{-1} and P_2O_5 kg ha^{-1} @ 50 kg ha^{-1} and K_2O @ 30 kg ha^{-1} to all the plots excepting absolute control.The crop was provided with irrigation at flower initiation and pod filling stage. The foliar spray of nutrients was given at 45 DAS and 60 DAS. The soil analysis was done the standard analytical procedure. The organic carbon wet oxidation method by (Nelson and Sommer. 1982, available nitrogen alkaline permanganate method (Subbaih and Asija. 1956.) available potassium neutral normal ammonium acetate method (Kundeson et.al. 1982). The observed data were analyzed statistically using analysis of variance at 5 per cent level of significance (panse and sukhame, 1997)

Results and Discussion

The pooled results from (2008-2009 to 2011-12), revealed that there was significant influences of different treatments on grain yield of chickpea (Table -1). The significantly higher grain yield (2275 kg ha^{-1}), of chickpea was recorded with the application of 2% KNO_3closely followed by the treatments T_3- KNO_3 0 .5 % (1968 kg. ha^{-1}). In case of straw yield (Table - 1) the application of 2% KNO_3gave significantly higher straw yield (3094 kg ha^{-1}), which was following by the treatments T_5- $KNO_{31.5}$ % (2705 kg ha^{-1}) as chickpea being a long day plant, any delay in flowering would facilitate more dry matter production. However, foliar application of potassium nitrate at flowering and pod filling significantly higher seed yield over control. So foliar application of potassium nitrate contribute in dry matter production (upto some extant) as indicated by delayed flowering also. The data presented in (Table -1) revealed that highest soil organic carbon (0.59%), which was followed by T_7- Urea 2% treatment organic carbon (0.55%) lowest was observed in control treatment.

The data presented in Table 1, available N, P and K status of soil after harvest of chickpea were significantly influenced due to application of different nutrients over initial status. The significantly higher residual nitrogen (228.4 kg. ha^{-1}), phosphorus (16.13 kg. ha^{-1}) and potassium (448.6 kg. ha^{-1}) were observed due to application of 2 %KNO_3. The improvement in nitrogen and Phosphorus status of soil may be ascribed to application of potassium (Sahai, 2004).The data presented in Table 2 indicate that total uptake of nutrients in respect of i.e. nitrogen (98.48 kg. ha^{-1}), Phosphorus (37.65 kg. ha^{-1}) and Potassium (78.02 kg. ha^{-1}) was maximum in T_6- treatments i.e 2 %KNO_3, which was followed by T_7- urea 2%,nitrogen 89.64 kg ha^{-1}), Phosphorus (33.83 kg. ha^{-1}) and Potassium (72.78 kg. ha^{-1}).Uptake of potassium was highest in chickpea with higher level

of foliar sprays of potassium due to its higher root cation exchange capacity and higher potassium utilization efficiency Tiwari et al. (1985)

Economics: The economics of treating chickpea with different foliar spray application of nutrient revealed that application of 2% KNO_3gave maximumgross monetary return (56890 ha^{-1}) was obtained in the treatment of 2% KNO_3. Net monetary return (Rs.19307 ha^{-1}) and B:C ratio (1.51). which was followed by T_5(1.5 kg. ha^{-1}) with gross monetary return (49296 ha^{-1}) net monetary return (Rs.12381 ha^{-1}) and B:C ratio (1.34) respectively.

Conclusion:

Application of recommended dose of fertilizers and two foliar sprays (at 50 % flowering and pod formation stages) of 2 % potassium nitrate are recommended for higher yield of chickpea under irrigated condition.

References

A.O.A.C. 1970 .Official Methods of Analysis, Association of Official Agriculture Chemist, Washington,D. C.

Ahmed, N., Davide, J.G. and Sleem, M.T.1988. Fertility status of soil in dry land area of Pakistan.In: Pro. Int.sem. on Dry land Agric. Of Pakistan. November 1988,6-8 : 22-49. Fauji Fertilizers Company Ltd. Lahore. Pakistan.

Hakoomat, A., Muhammad, A.K. and Shakeel, A.R. 2004. Interactive effect of seed inoculation and phosphorus application on growth and yield of chickpea. Int.J.Agric.Biol.., 6: 110-2

Halliday, D.J., 1992. IFA World fertilizers use manual, P.632.Int.Assoc. Paris.

Jackson M.L. 1967. Soil Chemical Analysis . Prentice Hall of India, Pvt.Ltd. New Delhi. PP.205.

Jackson M.L. 1973. Soil Chemical Analysis . Prentice Hall of India, Pvt.Ltd. New Delhi. Pp.10-114.

Kundsen, D., Peterson, G.A. and Pratt.P.F.1982. Litium, Sodium, Potassium, In method of soil analysis, part-2 Page, A.L., Madison, Wiscosin, USA.PP.228-245.

Nelson, D.W. and Sommer, L.E.1982. Total carbon and organic matter in method of soil analysis. Part-2 Al (Ed) II Edition, AM.Soc. Agron.Inc. and Soil. Sci.Am.Inc. Madison, Wisconsin,USA. PP.539-577.

Olsen S.R. and Dean L.A.1965.Estimation of available phosphorus in soil by extraction with sodium bicarbonate Govt. Printing Office Washington D.C. USAD, Circular No 939 : 1-19.

Panse, V.G. and Sukhatme, P.V. 1967. Statistical methods for agriculture workers. ICAR,Publ. PP.110-387.

Sahai, V.N. 2004.Mineral nutrients, In: Fundamental of Soil 3 rd Edition, Kalyani Publishers, New Delhi, India, PP: 151-155.

Subbiah B.V. and Asija G.L. 1956.A rapid procedure estimation of available nitrogen in soil. Current Science.: 259-260.

Tiwari, K.N. Vandana Nigam Pathalk, A.N. 1985. Studies on potassium requirements of different crops. Fertilizer Research 8 : 91-96.

Table 1: Effect of foliar application of nutrient to chickpea on grain, straw yield and soil fertility status at harvest

Tr. No	Treatment	Yield		Organic carbon	Soil available nutrients		
		(kg ha^{-1})		(%)	(kg ha^{-1})		
		Grain	Straw		N	P	K
1	Absolute control	1546	1882	0.41	193.5	12.92	416.2
2	Water spray	1603	2055	0.34	198.4	13.21	411.8
3	KNO_3 0.5%	1704	2277	0.49	204.7	14.21	425.6
4	KNO_3 1.0%	1864	2349	0.51	210.0	14.63	429.6
5	KNO_3 1.5%	1968	2592	0.53	215.6	14.91	436.7
6	KNO_3 2 %	2275	3094	0.59	228.4	16.31	448.6
7	Urea 2%	1967	2705	0.55	219.6	15.33	440.2
8	DAP 2%	1923	2438	0.51	211.5	14.35	431.8
	SE ±	77.1	77.1	0.094	1.20	0.29	0.76
	CD at 5%	233.9	226.6	0.282	3.51	0.87	2.11

Table 2: Effect of foliar application of nutrient to chickpea on nutrient uptake at harvest

Tr.No	Treatment	Nutrient Uptake (kg ha^{-1})		
		Nitrogen	Phosphorous	Potassium
1	Absolute control	58.72	23.69	57.86
2	Water spray	64.93	24.87	59.50
3	KNO_3 0.5%	72.68	26.03	63.10
4	KNO_3 1.0%	80.35	27.57	66.16
5	KNO_3 1.5%	85.70	29.70	70.51
6	KNO_3 2 %	98.48	37.65	78.02
7	Urea 2%	89.64	33.83	72.78
8	DAP 2%	83.52	28.02	66.60
	SE ±	2.69	0.92	1.42
	CD at 5%	7.93	2.60	4.16

Table 3: Economics of foliar application of nutrient to chickpea

Tr. No.	Treatment	Grain yield	Straw yield	Cost of cultivation	GMR	NMR	B:C ratio
		(kg ha^{-1})		(Rs.ha^{-1})			
1	Absolute Control	1546	1807	35471	38646	3175	1.10
2	Water spray	1603	2055	36029	40077	4048	1.11
3	KNO_3 0.5 %	1704	2277	35918	42608	6690	1.19
4	KNO_3 1.0 %	1864	2349	36264	46592	10327	1.28
5	KNO_3 1.5 %	1968	2592	36914	49296	12381	1.34
6	KNO_3 2 %	2275	3094	37582	56890	19307	1.51
7	Urea 2 %	1967	2705	37136	49192	12055	1.32
8	DAP 2 %	1923	2438	36991	48088	11096	1.30
	SE ±	77.1	77.1	-	1926	1926	-
	CD at 5%	233.9	226.6	-	5844	5844	-

Selling rates: Grain Rs. 25 kg^{-1}