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FOLIAR APPLICATION OF POTASSIUM ON URD BEAN

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ABSTRACT

Foliar application of phosphorus on moong bean and urd bean at the time of flowering at half and full basal fertilizer doses in different concentrations was applied and it was found that the treatment T_5 where 2.5 kg. Phosphorus / ha was applied as foliar spray showed best results. It enhanced almost all the vegetative and yield characteristics of moong bean and urd bean. The best result was observed at T_5 treatment at half basal fertilization dose. In this way a little amount of phosphorus used as foliar spray at the time of flowering when the plant required maximum nutrients can enhanced the productivity and save a large amount of fertilizers.

KEYWORDS : Potassium, Hectare, Treatment

Foliar application of Potassium on urd bean at the time of flowering at half basal fertilizer doses in different concentrations was applied and it was found that the treatment T_5 where 1.00 kg. Potassium / ha was applied as foliar spray showed best results. It enhanced almost all the vegetative and yield characteristics of urd bean. In this way a little amount of Potassium used as foliar spray at the time of flowering when the plant required maximum nutrients can enhanced the productivity and save a large amount of fertilizers.

Food is one of the basic needs for the existence of life on earth. All the food supply to animal kingdom directly comes from plants through an important physiological process known as photosynthesis. We therefore, depend on plants for our basic requirements. From very beginning of life, the man was in quest of food. Gradually the search for food compelled the whole civilization to come nearer to the agriculture.

Agriculture, the world's biggest industry, yields a greater variety of products than that of any other industry. About 80% of Indian population still live in the villages and depend on agriculture. The green revolutions have improved the condition of our farmers and today, we are self sufficient in cereals production. The credit goes to our Agricultural Scientists but still we could not get an appropriated goal in production of pulses. Therefore, agricultural scientists pay full attention towards the better productivity of pulses. These are important source of vegetarian protein for majority of population in India. The amino acid composition of pulse protein is such that a mixed diet of cereals and pulse has greater biological value than that of any other component alone. Thus pulses play a key role in removing the malnutrition in the country. The pulse crops have a unique property of maintaining and restoring soil fertility through biological nitrogen fixation as well as by conserving and improving the physical properties of the soil with the help of their tap root system.

Agricultural Scientists are engaged in the production of high yielding varieties of pulses by mutation and plant breeding. In order to achieve genetic limits of yield performance in any crop plants, it is essential that all environmental factors contributing its growth and development are kept at optimum. Plant growth and its productivity largely depend on the root system of the plant. Basal fertilizer dose significantly affected the vegetative and yield characteristic, therefore, the concentration of nutrient in soil should be maintained at critical value below which the growth of plant is decreased (Mengel and Kirby, 1982). Nitrogen, phosphorus and potassium play significant role in the growth and development of the plant and occupy an important position in plant nutrition. Some of the nutrients constitute an integral part of several biologically important macromolecules including amino acids, nucleosides, co-enzymes and growth hormones (Develin and Witham, 1986; Salisbury and Ross, 1986) which directly regulate plant metabolism. The nutrient, supplied to the plants as basal dressing is utilized by the plants through their root system and a large amount of them are fixed in the

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soil in such a form which is not utilized by plant. For the maximum utilization of these nutrients, foliar spray of the essential nutrients at the time of flowering when it is required in high amount for the reproductive growth is suggested by several earlier workers like Afridi and Samiullah,(1973a and 1973b); Rifat et.al., (2004) etc. Foliar application of potassium in different concentration at the time of flowering on urd bean was experimented which may enhance the grain yield.

MATERIALS AND METHODS

The field experiment was conducted at the research field of Shibli National P.G. College, Azamgarh, to study the effect of different concentration of potassium as foliar spray at the time of flowering on vegetative and yield characteristic of urd bean. The experiment was carried out with half basal fertilizer dose applied in the soil at the time of sowing. Different concentrations of potassium sprayed on the leaves of urd bean were T_1 (0.2 kg K/ha), T_2 (0.4 kg K/ha), T_3 (0.6 kg K/ha), T_4 (0.8 kg K/ha) and T_5 (1 kg K/ha). The healthy and disease free seeds of uniform size were selected for experiment. After proper surface sterilization of seed, the seeds were sown in the experimental plots. Five replicates of each concentration were made. The usual "behind the plough" method of sowing was adopted. The seeds were sown at the rate of 25 Kg/ha. The distances between the seeds were 1 X 1 feet. The field was irrigated five times between sowing and harvesting at 7, 21, 40, 55, 70 days. After sowing, weeding was done twice at interval of 30 days. Five replicates were made for each concentration to study vegetative and yield characteristics. The growth parameters were taken at 45 60 days and all the yield parameters were taken at the time of harvesting.

OBSERVATION

Comparison of the mean values of several morphological and yield characters of urd bean between control and the population treated with different concentration of potassium as foliar spray at the time of flowering at half basal fertilizer dose was made. The population treated with water was taken as control (T_0). The potassium concentrations used as foliar spray were 0.2 kg/ha, 0.4 kg/ha, 0.6 kg/ha, 0.8 kg/ha and 1 kg/ha as T_1, T_2, T_3, T_4 and T_5 treatment respectively. It was observed that almost all the vegetative and reproductive characters increased with the increase of potassium concentration. The height of the plant increased with the foliar application of potassium and maximum increase was recorded in T5 treatment where 1 kg K/ha as foliar spray along with half basal fertilizer dose. This increase was 20.29 per cent over control (Table). Length of petiole increased with each application of potassium and the maximum increase was 6.26 per cent in T_4 treatment. Breadth of lamina also increased and this increase was 53.51, 55.18, 76.25, 77.25 and 55.51 per cent in treatment T_1, T_2, T_3, T_4 and T_5 respectively over control. Number of stomata per unit area increased with potassium application and the maximum increase was recorded in T1 treatment, it was 91.50 per cent over the control. A little increase in the length of guard cell, breadth of guard cell, length and breadth of stomatal aperture was also increased with the application of potassium. Length of guard cell was unaffected with the foliar application of potassium. Breadth of guard cell increases by 7.43 per cent in T_5 treatment. Length of stomatal aperture and breadth of stomatal aperture also increased with potassium concentration (Table).

The reproductive characters taken into consideration were diameter of flower, number of pods per plant, length of pod and number of seeds per pod. Maximum increase in diameter of flower was recorded in T_5 treatment and it was 11.94 per cent over control. Number of pods per plant increased with the application of potassium concentration and maximum increase was recorded in T_5 treatment where 1.0 kg potassium per hectare was applied as foliar spray at the time of flowering. This increase was 45.41 per cent over control. Length of pod increases maximum in T_5 treatment. It was 20.44 per cent. Number of seeds per pod also increases with the application of potassium as foliar spray and maximum increase was recorded in T_5 treatment and it was 20.0 per cent. 1000 grain weight also increased with the application of potassium as foliar spray and maximum increase were recorded in T_3 treatment and It was 17.81 per cent.

Table: Comparison of the mean values of several vegetative and yield characters of Urd bean at half basal fertilizer dose between the control population and the population treated with different concentration of potassium as foliar spray at the time of flowering

S.No	Characters	No. of Samples	T_0	T_1	T_2	T_3	T_4	T_5
1.	Height of the plant (cm)	50	17.54 (9.4 – 22.2)	20.14 (9.8 – 30.4)	21.52 (9.8 – 30.4)	24.91 (10.4 – 30.4)	20.45 (11.4 – 35.4)	21.10 (11.2 – 34.2)
2.	Length of Petiole (cm.)	50	6.07 (2.5 – 6.5)	5.69 (2.4 – 7.8)	5.77 (4.2 – 7.6)	6.10 (4.6 – 8.1)	6.45 (4.3 – 8.5)	6.32 (4.6 – 8.7)
3.	Length of Lamina (cm)	50	5.38 (1.5 – 7.1)	5.82 (2.6 – 7.5)	6.19 (4.2 – 6.5)	6.19 (2.4 – 6.5)	6.31 (2.9 – 6.5)	6.28 (2.9 – 6.5)
4.	Breath of Lamina (cm)	50	2.99 (2.6 – 5.4)	4.59 (2.4 – 6.5)	4.64 (2.3 – 6.5)	5.27 (3.5 – 7.2)	5.30 (4.5 – 7.2)	4.65 (2.6 – 6.6)
5.	No. of stomata / unit area	50	12.72 (15.0 – 28.0)	25.00 (15.0 – 28.0)	22.80 (11.0 – 28.0)	24.02 (15.0 – 29.0)	24.48 (14.0 – 29.0)	24.36 (15.0 – 29.0)
6.	Length of guard cell (μ)	50	4.58 (4.0 – 5.0)	4.48 (3.0 – 5.0)	4.54 (4.0 – 5.0)	4.58 (4.0 – 5.0)	4.58 (4.0 – 5.0)	4.26 (4.0 – 5.0)
7.	Breadth of guard cell (μ)	50	2.42 (2.0 – 3.0)	2.46 (2.0 – 3.0)	2.34 (2.0 – 3.0)	2.44 (2.0 – 3.0)	2.38 (2.0 – 3.0)	2.60 (2.0 – 3.0)
8.	Length of stomatal apperture (μ)	50	4.56 (2.0 – 6.0)	4.88 (3.0 – 6.0)	5.27 (4.0 – 6.0)	5.46 (4.0 – 6.0)	5.46 (4.0 – 7.0)	5.46 (4.0 – 6.0)
9.	Breadth of stomatal apperture (μ)	50	2.54 (2.0 – 3.0)	2.28 (2.0 – 3.0)	2.44 (2.0 – 3.0)	2.44 (2.0 – 3.0)	2.52 (2.0 – 3.0)	2.50 (2.0 – 3.0)
10	Diameter of flower (cm)	50	1.34 (0.5 – 2.1)	1.42 (0.7 – 2.1)	1.49 (0.4 – 1.9)	1.47 (1.1 – 2.4)	1.44 (1.4 – 2.6)	1.50 (0.7 – 2.1)
11.	No. of pods / plant	50	12.86 (2.0 – 11.0)	15.14 (4.0 – 12.0)	15.88 (3.0 – 14.0)	16.10 (7.0 – 19.0)	16.64 (8.0 – 25.0)	18.70 (2.0 – 26.0)
12.	Length of pod (cm.)	50	4.06 (3.0 – 8.0)	4.14 (2.4 – 8.1)	4.80 (4.4 – 8.1)	4.69 (4.3 – 8.5)	4.29 (4.5 – 8.7)	4.89 (4.6 – 8.2)
13.	No of seeds / pod	50	4.20 (2.0 – 4.0)	4.12 (2.0 – 6.0)	4.36 (2.0 – 7.0)	4.50 (2.0 – 6.0)	4.44 (2.0 – 8.0)	4.80 (2.0 – 8.0)
14.	1000 grain weight (gm)	50	41.32	48.07	46.26	48.64	46.42	47.33
15	Grain yield Q/h	5	4.90	4.98	5.00	5.40	5.60	5.90

Range is given in parenthesis.
NB :T_0 = Control
T_1 = 0.2 Kg K/ha as foliar spray at the time of flowering.
T_2 = 0.4 Kg K/ha as foliar spray at the time of flowering.
T_3 = 0.6 Kg K/ha as foliar spray at the time of flowering.
T_4 = 0.8 Kg K/ha as foliar spray at the time of flowering.
T_5 = 1.0 Kg K/ha as foliar spray at the time of flowering

It was observed that almost all the vegetative and yield characters increased with the foliar application of potassium at the time of flowering in most of the cases. T_5 treatment where 1 kg K / ha was supplied as foliar spray in addition to half basal fertilizer dose, was found to be most effective.

Basal fertilizer doses effect the growth and development of the plants. The concentration of the nutrient in the soil should be maintained at the critical value below which the growth of plant decreases. Nitrogen, Phosphorus and Potassium play important role in the growth and development of the plants and occupy an important position in plant nutrition. Some of these nutrient constitute an integral part of several biologically important micro-molecules including amino acids, nucleosides, co-enzymes, purine, pyrimidines, nucleotides, intermediate metabolites and some growth hormones (Develin and Witham, 1986; Salisbury and Ross, 1986) which directly regulate metabolism.

Potassium is an important nutrient present in the soil in the form of its various salts. It is the most mobile plant nutrient. The most important role of potassium is in ionic and osmotic regulation. Potassium also works as co-factor or activator of several enzymes involved in protein and carbohydrate metabolism. It increases the efficiency of the leaf in manufacturing sugar and starch. Several workers like Sinha, (1961); Kabir et al., (2004); Musolf et al., (2004) etc. have reported that positive effect of potassium in vegetative and reproductive growth of several crops.

Effect of various spray of potassium at the time of flowering at half basal fertilizer dose on urd bean regarding the grain yield kg/ha was studied and data are presented in

Table. The increase in the grain yield of urd bean was due to combined effect of fertilizer and foliar spray of potassium.

Comparison between the control set and treatments was made, all the treatments showed increase in the grain yield of urd bean. The maximum increase was recorded in T_5 treatment where plant received 1 kg K/ha as foliar spray at the time of flowering and it was 17.82 per cent over control (T_0).

RESULTS AND DISCUSSION

Foliar application of different concentration of potassium on urd bean at half basal fertilizer doses at the time of flowering was studied and the data presented in (Table). The potassium application on leaf at the time of flowering showed beneficial effect on all the characters studied at half basal fertilizer dose. Almost all the vegetative and yield characters except length of guard cell, diameter of flower, number of pods per plant showed maximum increase at T_5 treatment where the plant was supplied at the rate 1 kg K/ha as foliar spray at the time of flowering. While the characters such as length of guard cell, diameter of flower and number of pods per plant showed maximum increase at T_4 treatment i.e. 0.8 kg K/ha as foliar spray at the time of flowering (Table).

The data pooled in Table indicated that the foliar spray of potassium at the time of flowering enhance all the vegetative and yield characteristics taken into consideration at half basal fertilizer dose. The treatment T_5 was proved to be the best treatment for almost all the parameters studied (Miller et. al. 1956)

This finding confirmed the earlier findings of Qaseem (1975) in wheat and barley yield. It may be concluded that the NPK fertilizers which are costly as well as in short supply can be saved by applying only 1.0 kg K/ha as foliar spray at the time of flowering on urd bean, gave maximum pulse yield. Further more, it is suggested that the treatment T_5 is far superior to all other treatments given in the present study. The next to the T_5 treatment was T_4 treatment which gave the second highest value in almost all the characters studied related to the yield. From the above going discussion, it may thus be recommended that the foliar spray of 1.0 kg K / ha on the plants at the time of flowering, receiving half basal fertilizer dose (15 kg N + 30 kg P + 10 kg K / ha) gave maximum yield.

REFERENCES

Afridi M.M.R.K. and Samiullah,1973a. A comparative study of the effect of the soil and leaf applied phosphorus on the yield of barley (*Hordium vulgare* L.). New Phytol., **72** : 113.

Afridi M.M.R.K. and Samiullah, 1973b. Effect of nitrogenous and phosphatic fertilizers on the malting quality of NP-13, a six-row barley (*Hordium vulgare* L.). Indian J. Agric. Sci., **43** : 922.

Devlin R.M. and Witham F.H., 1986. Plant Physiology (4th Edn.) CBS Publisher and Distributors, Delhi.

Kabir M.E., Karim M.A. and Azad M.A.K., 2004. Effects of potassium on salinity tolerance of mungbean (*Vigna radita* (L.) Wilczek). Journal of Biological Sciences, **4**(2) : 103 110.

Miller E.V., Army T.J. and Krackenberger H.F., 1956. Ascorbic acid, caroteins, riboflavin and thiamin content of turnip green in relation to nitrogen fertilization. Soil. Sci. Soc. Amer. Proc., **20**: 379-382.

Musolf R., Grizebirz W. and Szczepaniak W., 2004. Effects of potassium fertilization under diversified water condition on yield and quality of sugar beet (*Beta vulgaris* L.) Part II Quality of tap roots and yield of sugar. Soil and Fertilizers. Poland : 23-25.

Qaseem S.M. (1975). Effects of nitrogenous and phosphatic spray on the yield and grain quality of barley and wheat. Ph. D. Thesis, A.M.U., Aligarh.

Rifat H., Safdar A. and Khan F.S., 2004. Effect of nitrogen and *Rhizobium* inoculation on yield, N uptake and economics of mungbean. International Journal of Agric. And Biology, **6**(3) : 547-551.

Salisbury F.B. and Ross C., 1986. Plant Physiology 2nd Edn.. Pretice Hall of India Pvt. Ltd., New Delhi.

Sinha H., 1961. Effects of potassium-born interaction upon growth and composition of soybean and vegetable crops. Diss. Abstr. **22**: 1343-1344.