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Impact of different levels of potassium and FYM on potato (*Solanum tuberosum*) yield at gird region var. Kufri Chipsona-1

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Abstract
Potato is very important food crop of India and needs attention to increase its production. The experiment was conducted to evaluate the effect of farm yard manure (FYM) and its interaction effect with potassium fertilizers on yield of potato. Highest yield improvement was recorded in the treatment T_3 FYM_3 (125 kg/ha K_2O and 24 t/ha FYM). The interaction effect of FYM and K fertilizer resulted significantly increased the tuber yield as compared to control. Yield increased by 56.25% over control with the application of 125 kg/ha potassium fertilizer and FYM 24 t/ha (T_3 FYM_3) and the same increased by 50% and 43.75%, when FYM is applied with 8 t/ha and 16 t/ha.

Keywords: Potassium, farm yard manure, potato yield

Introduction
Potato (*Solanum tuberosum* L.) is one of the most important food crops both in developed as well as in developing countries. Potato is the fourth major food crop after rice, wheat and maize in the world. The widely grown potato is an autotetraploid with 2n = 48. In India about 68% potatoes are utilized for vegetable purpose, 7.5% for processing, 8.5% for seed and remaining 16% produce goes waste due to pre and post harvest handling. Potato tuberization is best favored at temperature 18.3 - 21.1 ºC. It is basically a cool season vegetable crop sensitive to frost and mainly grown during October/November to February/March.

The area and production of potato in India is 2158 thousand hectare and 51, 300 MT respectively (NHB 2019-20 2nd estimate). In gird region of MP area and production of potato is 967.23 thousand hectare and 19,144 MT (NHB 2019-2020) [5]. Potato tuber contains vitamin-C and vitamin- B. It provides carbohydrates, minerals and fibers. The protein is as comparable to that of milk and eggs. Potato is known as protective food because potato is rich in lysine which is one of the most important amino acids. Potato contains water (74.7-75%), sugar and starch (22.9%), fat (0.1%), minerals, vitamins (0.6%) and protein (1.21-2%). More than 80% of the potato crop in India is grown under Indo-gangetic plains during the winter season. The three major potato producing states in our country are UP, WB and Bihar contributing almost 60% of the total area and 78% of the production (Trehan *et al*., 2009 and MoA, 2011) [9, 4].

Potassium is responsible for translocation of carbohydrates and increased resistance to withstand drought and frost stresses. Potassium increases leaf expansion particularly at early stages of growth, extends leaf area duration by delaying leaf shedding near maturity. It increases both the rate and duration of tuber bulking. Potassium increases the size of tubers so it increases the yield by increasing the large sized tubers.

Potassium plays a role in sugar translocation and starch synthesis in plants. Due to high starch in potato tuber, K is an important nutrient in tuber development (Rhue *et al*., 1986) [6]. Potassium has a vital role in photosynthesis process that favours high energy status, regulates opening and closing of leaf stomata, nutrients translocation, water uptake, vitamin contents and organic acid concentration in plants (Bergmann, 1992) [1]. Potassium enhances storage life and improves shipping quality of potato as well as extends their shelf life (Martin-Prevel, 1989) [3]. Potassium influences synthesis, location, transformation and storage of carbohydrates, tuber quality and processing characteristics as well as plant resistance to stress and diseases.

Materials and Methods

The experiment on "Response of different level of potassium, FYM and its interaction on potato variety Kufri Chipsona-1" was carried out in the experimental area of the nursery, Department of Horticulture, College of Agriculture, Gwalior during the winter season of 2016-17 under the agro-climatic and soil conditions of Northern Madhya Pradesh. The nursery of College of Agriculture, Gwalior is situated at 26o 13 N latitude and 78o 14' E longitudes at an altitude of 211.5 m above sea level in gird belt (MLS). It has a subtropical climate where maximum temperature exceeds 45 ^{o}C in May-June. The minimum temperature reaches as low as 2 ^{o}C in December and January. Frost is expected from last week of December to first week of February. Usually monsoon arrives in the second fortnight of June and lasts till September.

The experiment was conducted in alluvial sandy clay loam soil having moderate salinity to standardize the agronomic practices of potato cultivation through application of FYM and potassium fertilizer with random block design having three replications. Present experiment was conducted to see the interaction impact of three level of FYM (8, 16 and 24 MT/ha) and three level of potassium (75,100 and 125 kg/ha) on yield of potato tubers. There were ten treatments (K_0 FYM_0, K_1 FYM_1, K_1 FYM_2, K_1 FYM_3, K_2 FYM_1, K_2YM_2, K_2 FYM_3, K_3 FYM_1, K_3 FYM_2 and K_3 FYM_3).

Seeds of potato (*Solanum tuberosum* cv. Kufri Chipsona-1) were collected from Department of Horticulture, College of Agriculture, Gwalior. The tuber seeds sown on ridges of 10 cm height and 15 cm ridge to ridge spacing in plot size of 3 x 3 mq. In order to preparation of land for cultivation the field is deep ploughed at twice. The fertilizer doses were applied before placing the seed tubers. Half of the nitrogen (100 kg/ha) and full dose of the phosphorus (80 kg/ha) at the time of field preparation/sowing and remaining half dose of the nitrogen was applied at 45 days after seed sowing. The FYM is applied at the time of ploughing and potassium along with half dose of nitrogen and full dose of phosphorus as basal doses. Irrigation and weeding were made on requirement basis. Initial germination was recorded for 15 days when tuber starts sprouting. Tuber yield were recorded at the end of the experiment after harvest.

Result and Discussion

Number of tubers per plant

The mean number of tubers/plant of different treatments are given in (Table- 1). Its graphical presentation has been shown in fig-1. Number of tubers per plant showed significant effect by application of different doses of potassium with FYM. The maximum number of tubers per plant were recorded in the treatment T_{10} (K_3 FYM_3) with 26.33 followed by T_9 (K_3 FYM_2) (25.00), T_8 (K_3 FYM_1) (23.00) and T_7 K_2 FYM_3 (22.33), while it was minimum in control T_1 (K_0 FYM_0) with 11.66. These similar findings were reported by Uwah (2013) and Sharma and Sud (2015). [10, 7]

Weight of tubers per plant (g)

The weight of tubers/plant recorded treatment wise and the mean value are depicted in (Table- 1) and diagrammatically shown in fig-2. Maximum weight of tubers per plant (615 g) was recorded in the treatment T_{10} (K_3 FYM_3). While the lowest weight of tubers (260 g) was recorded control plot T_1 (K_0 FYM_0). The increase in yield with the application of FYM and potassium could be attributed to corresponding increase in leaf area, which was responsible for synthesizing photosynthetic and increase in number and weight of tubers. Potassium also play important role in increasing weight of tuber due to stimulating effect of potassium on photosynthesis, phloem loading and translocation as well as synthesis of large molecular weight substances within storage organs. These findings were supported by Zeru and Msfin (2015 and Zelelew *et al.* 2016) [12, 11].

Tuber yield

The yield of any crop is the final index of the experiment which indicates the success or failure of any treatment with this view the tuber yield of potato was recorded. In the current experiment response of different level of potassium with FYM showed significant effect on total yield of tubers. The treatment T_{10} (K_3 FYM_3) was recorded significantly superior and gave the maximum (25.00 MT) tuber yield/ha and which was at par with treatment T_9 with 24.00 MT/ha. While, the lowest 16.00 MT/ha tuber yield/ha was noted in control plot T_1 (K_0 FYM_0) with FYM. The increase in yield due to K fertilization, stimulation effect of potassium on photosynthesis. Phloem loading and translocation as well as synthesis of large molecular weight substances within storage organs. The present findings are in accordance to those of Sharma and Arora (2009, Jaipaul *et al*. 2011, Sharma and Sud 2015 and Zelelew *et al*. 2016) [8, 2, 7, 11].

Table 1: Effect of different levels of potassium and FYM on potato quality and yield parameters

S. No.	Treatment combinations	Number of tubers/plant	Weight of tubers/plant (g)	Tuber yield/plot (kg)	Tuber yield/ha (t)
T1	K_0FYM_0	11.66	260.00	12.66	16.00
T2	K_1FYM_1	15.00	266.00	14.33	18.33
T3	K_1FYM_2	16.00	315.00	15.33	20.00
T4	K_1FYM_3	20.00	323.33	17.66	18.66
T5	K_2FYM_1	21.00	343.33	15.66	21.00
T6	K_2FYM_2	20.33	365.00	18.00	19.66
T7	K_2FYM_3	22.3	390.00	17.33	21.33
T8	K_3FYM_1	23.00	400.00	19.00	23.66
T9	K_3FYM_2	25.00	450.00	20.33	24.00
T10	K_3FYM_3	26.33	615.00	22.00	25.00
S.Em±		1.19	49.59	1.00	0.98
C.D. at 5%		3.56	148.48	2.99	2.93

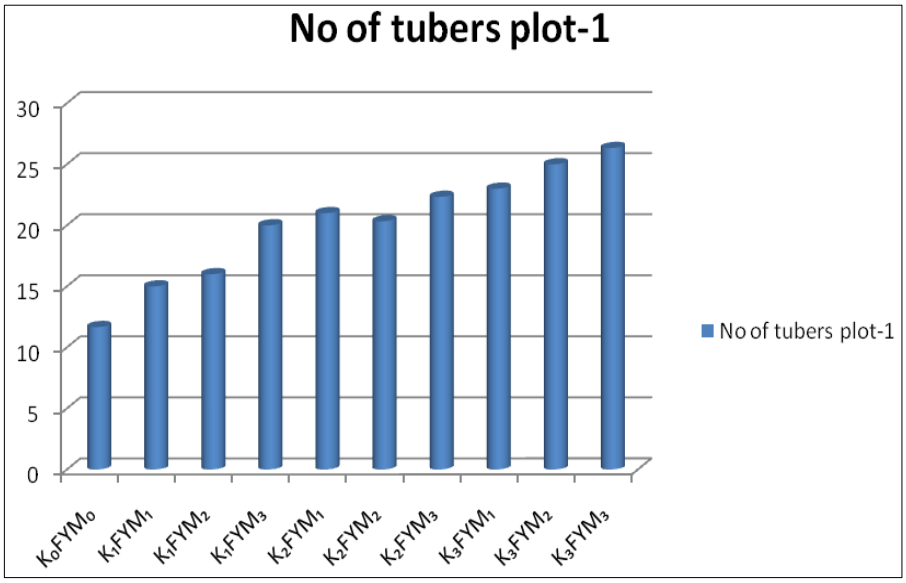

Fig 1: Number of tubers/ plant influenced by different levels of potassium and FYM

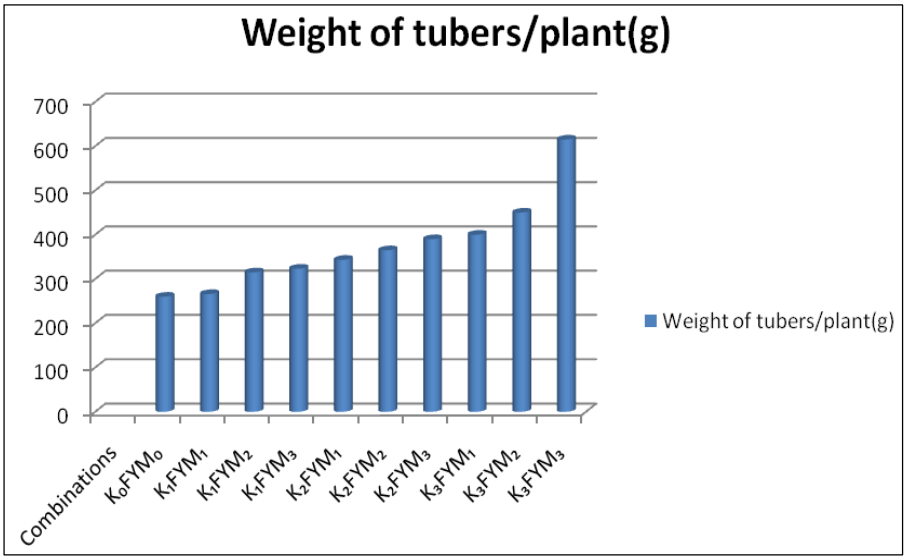

Fig 2: Weight of tubers/plant as influenced by different levels of potassium and FYM

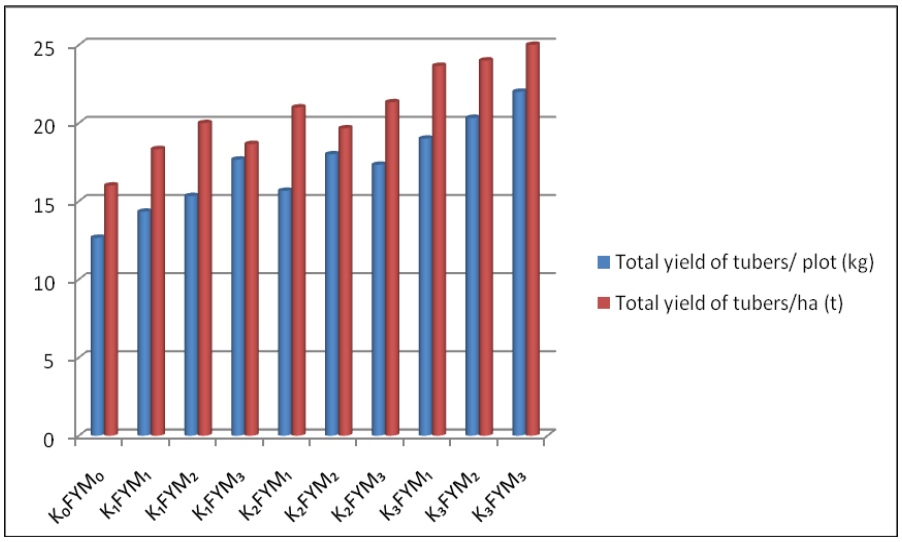

Fig 3: Total yield of tubers/plot (kg) or (ton)/ha as affected by different levels of potassium and FYM

Conclusion

It is concluded that treatment T_{10} (125 kg/ha) potassium with FYM (24 t/ha) for the processing variety Kufri Chipsona-1 responded well in terms of growth, yield and yield attributing characters in gird region of Madhya Pradesh with net return of 221600 Rs/ha and cost benefit ratio 1:3.98.

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References

1. Bergmann W. Nutritional disorders of plant development, visual and analytical diagnosis 1992.
2. Jaipaul, Sharam S, Sharma AK. Effect of different organic fertilizer on potato yield and other quality attributes under rainfed conditions of central Himalayan region of Utrakhand. Potato J 2011;38(2):176-181.
3. Martin, Pervez PJ. Physiological process related to handling and storage quality of crops. Proceedings of the 21st IPI Colloquium: methods of potash research in plants. Bern Switzerland Int. Potash Inst 1989, 219- 248.
4. MoA. Agricultural statistics at a glance. Department of Agriculture and Corporation, Directorate of Economics and Statistics, Ministry of Agriculture (MoA), Government of India New Delhi 2011, 367.
5. NHB National Horticulture Board, database 2019. www.nhb.gov.in
6. Rhue RD, Hensel DR, Kidder G. Effect of K fertilization on yield and leaf nutrient concentrations of potatoes grown on a sandy soil. American Potato J 1986;63:665-681.
7. Sharma RC, Sud KC. Potassium management for yield and quality of potato. J Central Potato Res. Inst. Shimla. 2015, 363-381.
8. Sharma US, Arora BR. Effect of nitrogen, phosphorus and potassium application yield of potato tuber. J of Agri. Sci 2009;(2):321-329.
9. Trehan SP, Pandey SK, Bansal SK. Potato nutrition of the potato crop - the Indian scenario. Optimising crop nutrition 2009;19:2-9.
10. Uwah DF, Undie UL, john NM, Ukoha GO. Growth and yield response of improved sweet potato (*Ipomoea batatas* L.) varieties to different rates of potassium fertilizer in Calabar, Nigeria. J of Agri. Sci 2013;5(7):61-69.
11. Zelelew DZ, Sewa L, Kidane TT, Ghebreslassie BM. Effect of potato levels on growth and productivity of potato varieties. American J of Plant Sci. 2016;7:1629-1638.
12. Zeru D, Mesfin B. Response of potato varieties to potassium levels in Hamelmalo area, Nigeria. J of Plant Stu 2015;5(1):11-19.