

Impact of organic manures on yield of potato (*Solanum tuberosum* L.) in semi-arid condition of Western U.P.

S.B. SINGH AND S.K. CHAUHAN

Deptt. of Agronomy R.B. S.College, Bichpuri, Agra-283105

Abstract

A field experiment was conducted at Cropping System Research Project, R.B.S.College, Bichpuri, Agra during Rabi season 2006-07 and 2007-08 with eight treatments. The results revealed that plant per meter row length, height of main shoot, dry matter(g) and number of leaves/plant higher in T_4 treatment. Followed by T_1 and T_5 and minimum with T_8 . On an average treatment T_4 (1/3 N-FYM+1/3N-Vermicompost + 1/3N-Neem cake plus agronomic practices for weed and pest control (without chemical) significantly maximum tuber yield and A grade B grade and C grade tuber of potato.

Key words: Potato, organic farming, vermicompost, neem cake.

Introduction

There are few foods, which are as versatile as potato. Potato is a favourite food throughout the world, both in its fresh and processed forms. Potato is unique in a sense that it can fit into any meal. In world, India ranks third in potato production. The major potato growing states in India are; U.P., Bihar, West Bengal, Punjab, M.P. and Assam, however, the contribution of U.P. in potato production is prime(nearly 44%) in the country. In U.P. Agra has been declared as 'Potato-Agri-Export Zone' since 2001. For increasing the per hectare productivity as well as production of potato in Agra region of Western part of U.P. (AESR-4.1) under irrigated condition , the use of organics like FYM, Compost, Vermi-compost, Bio-fertilizers (Azotobacter, Azospirillum, PSB etc) is an essential part to boost up the potato yield, which would help to encourage organic farming (O.F.), so as to avoid the adverse effect of agro-chemicals (Pesticides, fungicides and herbicides) on human health.

Materials and Methods

A field experiment was carried out during Rabi season 2006-07 and 2007-08 at Cropping System Research Project (ICAR),R.B.S.College, Bichpuri, Agra on sandy loam soils analysis normal in pH (7.9), low organic carbon(0.32%) and available N (182 kg. h^{-1})medium in available P (12.5kg. h^{-1}) and available K (218 kg. h^{-1}). The fixed plot experiment was laid out in four times replicated Randomized Block Design. The experiment composed eight treatments i.e. 1.50% recommended NPK- fertilizer + 50%N-FYM (T_1) 2. 1/3 N-FYM +1/3N-vermicompot+1/3N Neem cake (T_2). 3. T_2 +intercropping (Radish) (T_3). 4 T_2 + Agronomic practices for weeds control (Khurpi

weeding and pest control) (T_4). 5. 50% N-FYM + bio-fertilizer for N-Azotobacter in potato and Rhizobium culture in previous clusterbean crop + rock phosphate(T_5). 6 T_2 +bio-fertilizer for N-culture Azotobacter + for P-PSB (T_6). 7. 100% NPK-fertilizer+ secondary(sulphur) and micro-nutrients(Zn) soil test based(T_7).8. T_8 control. The potato variety Kufri Bahar (3797) sown under the experiment in two years. Other management practices were adopted as per recommendation and need of the crop. Tuber yield of component crop and important yield attributing characteristics were work out based on the net plot and randomly selected four plant sample. Soil sample were taken from 0-22.5 cm soil layer at the beginning and end of experiment to find out initial status of experimental site soil and changes in available N, P and K in the soil after the experimental period. Soil samples drawn at the beginning of the experiments were analyzed for organic carbon, pH and available N.P.K by following standard procedure.

Results and Discussion

The growth characters of potato i.e. plants per meter row length, plant height (cm), dry matter per plant (g) and number of green leaves per plant(table-1) clearly indicated that the levels of organic fertility maintained through organic fertilizer significantly affected the number of plants per running meter was recorded with T_4 (T_2 +Agronomic practices for weed control (Khurpi weeding and pest control) higher followed by T_1 and T_5 and minimum with T_8 . The potato plant height was recorded at harvest stage the height of plant significantly higher in T_4 and lowest in T_8 treatment. The dry matter and number. of green

Table 1: Crop growth phonological characters at successive stage of crop growth in potato as affected by various treatments(Pooled data of two years).

S.No.	Treatments	Plants /shoots m ⁻¹ row length at harvest stage	Height of main shoot(cm) at harvest stage	Dry matter accumulation(g) per plant at 90 DAS	Number of leaves per plant at 90DAS
1	T ₁	22	32.5	16.0	172
2	T ₂	21	31.0	14.5	159
3	T ₃	22	21.0	7.0	110
4	T ₄	20	32.0	15.0	165
5	T ₅	21	26.0	12.0	142
6	T ₆	19	22.5	9.0	121
7	T ₇	17	26.0	12.5	139
8	T ₈	14	18.3	8.2	122.4
	CD(p=0.05)	1.79	1.349	0.98	8.73

Table 2: Yield attributing characters per plant studies and tuber yield (q h⁻¹) at harvest stage of crop growth in potato as affected by various treatments (Pooled data of two years).

S.No.	Treatments	Number of tubers per plant	Weight of tubers per plant(g)	Grade of tuber			Tuber yield (q h ⁻¹)
				A grade	B grade	C grade	
1	T ₁	9	89	161.8	83.0	36.23	281.03
2	T ₂	8	77	143.8	72.0	51.85	267.65
3	T ₃	6	65	107.0	59.1	50.17	216.27
4	T ₄	10	95	171.6	88.8	46.81	307.21
5	T ₅	7	68	128.9	62.0	57.56	248.46
6	T ₆	7	73	142.0	71.0	54.27	267.27
7	T ₇	8	82	150.7	76.7	44.62	272.02
8	T ₈	6	60	118.2	66.5	30.80	215.50
	CD(p=0.05)	1.787	7.727	8.174	6.19	6.218	7.116

leaves so higher in T₄ treatment and significantly lowest in T₈ treatment in two years average data.

Yield attributing characters namely; number of tubers, weight of tubers(g) and grade wise yield of tubers recorded at harvest and presented in table 2. The number of tuber per plant significantly higher in T₄ treatment and lowest in T₈ treatment. The potato tuber weight per plant (g) was high in T₄ and lowest in T₈ treatment. Singh et al. (2003) conducted same result in potato.

An examination of the data portrayed in table-2 indicated that various treatments of fertility had significant effect on per hectare tuber yield(q ha⁻¹). The maximum tuber yield (307.21qh⁻¹) was occurred with treatment T₄(1/3N-FYM+1/3N-Vermicompost +1/3N-Neem cake+Agronomic practices for weed control and pest control with herbicides and insects – Neem oil @ 0.2%). Followed by T₁ (50% recommended NPK through fertilizers + 50% N FYM) i.e. 281.03 q h⁻¹ and minimum yield (215.50 q h⁻¹) of

tubers with T₈ (Control plot). Treatments T₄, T₁, T₆ and T₃ remained statistically at par while T₇, T₅, T₂ and T₈ were pooled similar in lower order. On an average, treatment T₄ (1/3N –FYM+1/3N-vermicompost + 1/3N-Neem cake plus Agronomic practices for weed and pest control without chemicals) exhibited significantly maximum tuber yield to the extend of Singh et al. (2004) reported like wise.

References

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