

Original Research Article

Effect of Organic Manures on Potato Yield and Soil Health

Raj Kumar^{1*}, A.P. Singh¹, B.N. Singh², R.C. Tiwari³ and Ved Prakash⁴

¹Department of Vegetable Science, ²Department of Agronomy, ³Department of Agronomy, ⁴Department of Soil Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj Ayodhya- 224229, India

**Corresponding author*

ABSTRACT

The experiment entitled “Effect of organic manures on Potato yield and its impact on crop health” was conducted at vegetable form of the Acharya Narendra Deva University of Agriculture and Technology Kumarganj, Ayodhya (U.P.) during 2018-19. The experiment was laid out in randomized block design with three replication having seven treatment combinations. T₁ Control, T₂ - FYM 30t/ha + biofertilizer (PSB), T₃ Poultry manure 5t/ha + biofertilizer (PSB), T₄ Vermicompost 7.5t/ha + biofertilizer (PSB), T₅ FYM 10t/ha + Poultry manure 1.7 t/ha + vermicompost 2.5t/ha + biofertilizer (PSB), T₆ Recommended dose of nitrogen (150kg/ha) in which 67% N through inorganic and 33% N through FYM + biofertilizer (PSB), T₇ Farmers practices (through organic). Growth and yield of potato increased with combined use of organic (67% N) and inorganic (33% N) nitrogen in comparison to alone organic N. Application of integrated nitrogen management (67%N through Urea + 33%N through FYM+PSB) was found better to increased potato tuber. The mineralization of organic manures decrease the soil pH and slightly improved the soil health of potato field.

Keywords

Organic manures,
Potato, Yield and
Soil health

Introduction

Organic manures not only supply the nutrients but also improve the physical environment for better plant and tuber growth. The manures alone are poor sources of nitrogen for obtaining optimum potato yield but improve organic carbon status of soil. Presently, FYM is a major source of organic matter and nutrients, besides poultry manure and vermin-compost. These organic sources generally contain low level of

nutrients and are required in higher amounts to fulfill the needs of crop, therefore, it is essential to supply the nutrients in integrated manner. By this way the dependence on fertilizer can be reduced in the days to come and in the mean time the soil will also develop its quality and fertility status by the continuous use of organic sources. Integrated use of organic and inorganic is a must to supply balance nutrition to potato. Bio-fertilizer (PSB) play important role in solubilise the nutrients available in the soil.

Materials and Methods

The field experiment was carried out at, Vegetable Research Farm of Acharyaarendra Deva University Agricultural and Technology Kumarganj, Ayodhya during autumn-winter season 2018-19. Experiment was conducted in randomized block design with three replications having seven treatment combinations. T₁ Control, T₂ - FYM 30t/ha + biofertilizer (PSB), T₃ Poultry manure 5t/ha + biofertilizer (PSB), T₄ Vermicompost 7.5t/ha + biofertilizer (PSB), T₅ FYM 10t/ha + Poultry manure 1.7 t/ha + vermicompost 2.5t/ha + biofertilizer (PSB), T₆ Recommended dose of nitrogen (150kg/ha) in which 67% N through inorganic and 33% N through FYM + biofertilizer (PSB), T₇ Farmers practices (through organic). As per the treatments organic manures i.e. FYM, Vermicompost and Poultry Manure were applied during final land preparation and inorganic nitrogen (Urea) half dose applied as basal and remaining half of N was applied as top dressing at the time of earthing-up. The potato variety (K. Ashoka) crop was raised follow the GAP of the region. Soil health

parameters was analysed by standard laboratory methods.

Results and Discussion

Growth and yield of Potato increased with the addition of organic manures in all the treatments except control. Treatment T₆ was found better in which integration of inorganic (67% through urea) and organic (33% through FYM) + bio-fertilizer (PSB) was applied. Maximum plant height (41.50cm), grade wise tuber yield i.e. 0-25g (1.93t/ha) 25-50g (11.52t/ha), 50-75g (14.58t/ha), 775g (10.37t/ha) and total yield (38.41t/ha) were obtained under T₆ treatment which was superior over rest of the treatments.

Maximum N content (0.48%) P (09%) K (0.49%) and uptake of N (140.58kg/ha), P (26.15kg/ha) and K (145.57kg/ha) were also found under T₆ treatments. This might be due to integrated nutrients management, which enhance nutrients availability and nutrients uptake as well as better growth and activity of roots. Similar findings were also observed by Yadav *et al.*, (2014) (Table 1-3).

Table.1 Effect of organic manures on plant height and tuber yield of potato

Grade wise tuber yield t/ha						
Treatment	Plant height at 60 DAP (cm)	0-25g	25-50g	50-75g	>75g	Total Yield
T ₁	34.50	0.93	3.95	4.38	3.95	13.22
T ₂	35.00	1.43	8.35	10.55	7.47	27.80
T ₃	35.40	1.50	8.87	11.26	7.99	29.62
T ₄	35.00	1.45	8.70	11.05	7.81	29.01
T ₅	37.50	1.54	9.18	10.98	8.87	30.58
T ₆	41.50	1.93	11.52	14.58	10.37	38.41
T ₇	34.45	1.52	9.07	9.53	3.56	26.28
SE(a)	1.14	0.07	0.40	0.51	0.35	1.32
CD	3.40	0.15	0.88	1.12	0.77	2.90

Table.2 Effect of organic manures on nutrients content and uptake by Potato Crop

Treatments	Nutrients composition (%)			Nutrients uptake by tuber (kg/ha)		
	N	P	K	N	P	K
T ₁	0.43	0.08	0.45	43.30	8.43	45.36
T ₂	0.45	0.09	0.46	96.08	18.08	97.46
T ₃	0.46	0.09	0.47	103.94	19.49	106.15
T ₄	0.45	0.09	0.47	101.07	18.87	104.01
T ₅	0.46	0.09	0.47	107.26	20.35	111.12
T ₆	0.48	0.09	0.49	140.58	26.15	145.57
T ₇	0.44	0.08	0.47	89.53	17.02	94.14
SE(a)	0.01	0.00	0.01	5.08	0.86	4.76
CD	0.01	NIL	0.01	11.19	1.90	10.49

Table.3 Soil health of experiential field after harvesting of Potato crop

Treatments	Soil health					
	pH	EC (dSm ⁻¹)	OC (%)	Av. N (Kg/ha)	Av. P (Kg/ha)	Av. K (Kg/ha)
T ₁	8.2	0.24	0.30	140.0	13.7	268
T ₂	8.1	0.22	0.33	149.0	15.0	272
T ₃	8.1	0.22	0.33	149.2	15.0	274
T ₄	8.1	0.22	0.36	149.5	15.0	274
T ₅	8.0	0.21	0.36	150.2	15.2	275
T ₆	8.0	0.21	0.32	156.5	15.0	272
T ₇	8.1	0.22	0.33	149.7	15.0	272
Initial status of soil	8.2	0.24	0.30	138.9	13.5	268

The fertility status of experimental soil was slightly improved after harvesting of potato might be due to addition of organic manures. Among different treatments maximum soil health improvement was recorded in T₅ (FYM 10t +Poultry manure 1.7t + Vermicompost 2.5t/ha + PSB) treatments as compared to other treatments except control. Integrated nitrogen management which favoured the conversion of organically bound N to inorganic form, Yadav *et al.*, (2014), solubilization of native P in the soil through released of various organic acid and Co₂ during decomposition of organic manures K status in post harvest soil increased due to application of different organic manures and PSB helped in the

solubilization of phosphorus in the soil Roy and Singh (2014).

On the basis of one year results it may be concluded that application of integrated nitrogen management (67%N through Urea + 33%N through FYM+PSB) was found better to increased potato tuber yield. The mineralization of organic manures decrease the soil pH and slightly improved the soil health of potato field.

References

Roy R, Singh K. (2014). Effect of INM on sequential productivity, economics and nutrients uptake of rice potato

- cropping system. *Indian Jr. of Agril. Sc.* 84(9):1096-1101.
- Yadav SK, Srivastava AK, Bag TK. (2014). Effect of INM on production seed tuber of true potato seeds. *Indian Journal of Agronomy.* 54(4):646-650.