



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2021; 9(1): 1333-1335

© 2021 IJCS

Received: 18-11-2020

Accepted: 27-12-2020

Bapi Das

ICAR-Central Potato Research Station, Shillong, Meghalaya, India

Clarissa Challam

ICAR-Central Potato Research Station, Shillong, Meghalaya, India

Manoj Kumar

ICAR-Central Potato Research Institute, Shimla, Himachal Pradesh, India

P Janani

ICAR-Central Potato Research Station, Shillong, Meghalaya, India

N Sailo

ICAR-Central Potato Research Station, Shillong, Meghalaya, India

Corresponding Author:**Bapi Das**

ICAR-Central Potato Research Station, Shillong, Meghalaya, India

Effect of integrated nutrient management on tuber yield of potato under Meghalaya agro-ecological condition

Bapi Das, Clarissa Challam, Manoj Kumar, P Janani and N Sailo

DOI: <https://doi.org/10.22271/chemi.2021.v9.i1s.11408>

Abstract

A field experiment was conducted during the summer season of the year 2016-2017 and 2017-2018 at Central Potato Research Station, Shillong, Meghalaya to find out the effect of integrated nutrient management in potato (Var. Kufri Jyoti) under Meghalaya agro-ecological condition. The experiment was laid out in randomized block design with nine treatment and replicated thrice. The nine integrated nutrient treatments are 100% RDF, 25% RDF + 75% RDN-FYM, 75% RDF + 25% RDN-FYM, 25% RDF + 75% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria, 75% RDF + 25% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria, 100% RDN-FYM, Boron, Azotobacter + PSB + Potash mobilizing bacteria and control. Among the various treatments it was observed that highest yield was obtained in the treatment 75% RDF + 25% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria (20.06 t/ha) followed by 75% RDF + 25% RDN-FYM (17.50 t/ha) and 100% RDF (16.90 t/ha) and lowest yield was obtained in the treatment of control (4.83t/ha) on the basis two years pooled data. The highest total number of tuber per hectare was obtained in the treatment 75% RDF + 25% RDN-FYM (763425.92 /ha) followed by 75% RDF + 25% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria (731018.51 /ha) and lowest total number of tuber per hectare was obtained in the treatment of control (306944.44 /ha) on the basis two years pooled data.

Keywords: Potato, INM, FYM, PSB, Potash mobilizing bacteria, yield

Introduction

Potato (*Solanum tuberosum* L.) belongs to family Solanaceae, is one of the most important tuber vegetable crop grown in India as well as around the world. India is the second largest producer of potato in the world after China. Potato is one of the most important tuber crop grown by the farmers of whole Northeast India. Using only chemical based fertilizer is not suitable for long run sustain agriculture and we can overcome this problem by using integrated plant nutrient approach consist of a combination of chemical fertilizers, organic manures, bio-fertilizers and micronutrient are play important role to sustain crop production, improve soil health and soil bio-diversity and preserve the healthy soil for future crop production. Using organic manures, bio-fertilizer increase the beneficial microorganism in the soil which help for better crop yield. Continuous use of only chemical fertilizers can destroy the soil texture and structure as well as decrease the organic matter content from the soil. Biofertilizers is an important input in organic agriculture play a tremendous role for maintaining long run good soil health. Chemical fertilizer dose along with organic fertilizers specially FYM, *Azotobacter* and crop residues increase the productivity of rice-potato-okra cropping sequence (Benerjee *et al.* 2016) [1]. Application of Biofertilizers along with organic and inorganic fertilizers has positive and significant influence on yield and its attributes (Sethy BK *et al.*, 2019) [3]. Application of phosphate solubilizing bacteria as inoculants simultaneously increases P uptake by the plant and crop yield (Vikash Kumar *et al.* 2020 and Rodríguez *et al.*, 1999) [5, 2]. Integrated use of inorganic and organic sources of nutrients significantly improved the yield of potato (Sumati Narayan *et al.* 2013) [4].

Materials and Methods

A field experiment was conducted during the summer season of the year 2016-2017 and 2017-2018 at Central Potato Research Station, Shillong, Meghalaya. Geographically experimental field are located at 25°54' N, 91°84' E and 1770 m above mean sea-level. The experiment was laid out in randomized block design with nine treatment and replicated thrice. The nine integrated nutrient treatments are T1- 100% RDF, T2- 25% RDF + 75% RDN-FYM, T3- 75% RDF + 25% RDN-FYM, T4- 25% RDF + 75% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria, T5- 75% RDF + 25% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria, T6- 100% RDN-FYM, T7- Boron, T8- Azotobacter + PSB + Potash mobilizing bacteria and T9- Control (Without using any fertilizer input). Kufri Jyoti was the potato variety used in this research programme. The recommended dose of N, P, and K was taken as 140, 120 and 60 kg/ha for the crop. Nitrogen, phosphorus and potassium was applied in the form of urea, SSP and MOP respectively. Biofertilizers (*Azotobacter* + PSB + Potash mobilizing bacteria) was applied through seed inoculation at the time of sowing. Ridges and furrow planting method is follow in this research programme with spacing 60x20cm. Earthing up and weeding was done after 30 days after planting and one more weeding was done after 50 days of planting. Plant protection measures were used as per standard recommendations in this region for potato crop to control diseases and insects at the

right time. All the statistical analysis was done using OPSTAT statistical software.

Results and Discussion

Effect of INM on total number of tuber: The results revealed that among the various treatments the highest total number of tuber per hectare was obtained in the treatment 75% RDF + 25% RDN-FYM (763425.92 /ha) followed by 75% RDF + 25% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria (731018.51 /ha) and lowest total number of tuber per hectare was obtained in the treatment of control (306944.44 /ha) on the basis two years pooled data (2016-2017 and 2017-2018). The data revealed that during the 1st year (2016-2017) of study the highest total number of tuber per hectare was obtained in the treatment 75% RDF + 25% RDN-FYM (759259.25/ha) followed by 100% RDN-FYM (729166.66 /ha) lowest total number of tuber per hectare was obtained in the treatment of Boron (311111.11/ha). During the 2nd year (2017-2018) of study the highest total number of tuber per hectare was obtained in the treatment 75% RDF + 25% RDN-FYM (767592.59 /ha) followed by 75% RDF + 25% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria (736574.07/ha) and lowest total number of tuber per hectare was obtained in the treatment of control (293518.51 /ha). Sumati Narayan *et al.* (2013) [4]. Reported that integrated nutrient management practices significantly influenced the number of different grades of tuber.

Table 1: Effect of Integrated nutrient management on Total numbers of tuber and Total tuber yield of potato (Pooled data of two years 2016-2017 & 2017-2018)

Treatment	Total number of tuber/ha	Total tuber yield (t/ha)
T1	564120.37	16.90
T2	503472.22	14.96
T3	763425.92	17.50
T4	610416.66	16.13
T5	731018.51	20.06
T6	730787.03	16.26
T7	327777.77	6.72
T8	359490.74	10.23
T9	306944.44	4.83
S.Em±	29860.83	0.74
CD (P=0.05)	90293.59	2.24

Table 2: Effect of Integrated nutrient management on total number of tubers of potato for the year 2016-2017

Treatment	Number of tubers / ha (2016-17)				Total Nos. tuber/ha
	0-25g	25-50g	50-75g	>75g	
T1	307870.37	154166.66	77314.81	21759.25	561111.11
T2	289351.85	144907.40	62037.03	5092.59	501388.88
T3	493055.55	201388.88	61111.11	3703.70	759259.25
T4	370370.37	162962.96	62500.00	8333.33	604166.66
T5	388888.88	265740.74	65740.74	5092.59	725462.96
T6	494907.40	198148.14	31944.44	4166.66	729166.66
T7	252777.77	51388.88	6944.44	0.000	311111.11
T8	233796.29	71296.29	36111.11	9259.25	350462.96
T9	253703.70	60648.14	6018.51	0.000	320370.37
S.Em±	42034.98	26892.34	9926.30	4243.82	51148.67
CD (P=0.05)	127105.93	81317.42	30015.28	N.S.	154664.05

Table 3: Effect of Integrated nutrient management on total number of tubers of potato for the year 2017-2018

Treatment	Number of tubers / ha (2017-18)				Total Nos. Tuber/ha
	0-25g	25-50g	50-75g	>75g	
T1	308796.29	160185.18	78240.74	19907.40	567129.63
T2	290277.77	146296.29	62962.96	6018.51	505555.55
T3	494907.40	204629.63	63425.92	4629.63	767592.59
T4	377314.81	164814.81	64351.85	10185.18	616666.66

T5	389814.81	274537.03	67129.63	5092.59	736574.07
T6	499074.07	195370.37	32407.40	5555.55	732407.40
T7	283333.33	52777.77	8333.33	0.000	344444.44
T8	249074.07	72222.22	36574.07	10648.14	368518.51
T9	244907.40	43518.51	5092.59	0.000	293518.51
S.Em±	7559.56	9126.00	4621.58	2288.95	12373.85
CD (P=0.05)	22858.70	27595.32	13974.81	6921.35	37416.23

Effect of INM on tuber yield

The results revealed that among the various treatments the highest yield was obtained in the treatment 75% RDF + 25% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria (20.06 t/ha) followed by 75% RDF + 25% RDN-FYM (17.50 t/ha) and 100 % RDF (16.90 t/ha) and lowest yield was obtained in the treatment of control (4.83 t/ha) on the basis two years pooled data (2016-2017 and 2017-2018). The data revealed that during the 1st year (2016-2017) of study the highest yield was obtained in the treatment 75% RDF + 25% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria (19.23 t/ha) followed by 75% RDF

+ 25% RDN-FYM (17.06 t/ha) and lowest yield was obtained in the treatment of control (5.41 t/ha). During the 2nd year (2017-2018) of study the highest yield was obtained in the treatment 75% RDF + 25% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria (20.90 t/ha) followed by 75% RDF + 25% RDN-FYM (17.94 t/ha) and lowest yield was obtained in the treatment of control (4.25 t/ha). Sumati Narayan *et al.* (2013)^[4]. Reported that various treatment of organic and inorganic nutrient combinations had significant effect on yield and related parameters. The similar result also found by Vikash Kumar *et al.* (2020)^[5].

Table 4: Effect of Integrated nutrient management on tuber yield of potato for the year 2016-2017

Treatment	Tuber yield (t/ha) (2016-17)				Total tuber yield (t/ha)
	0-25g	25-50g	50-75g	>75g	
T1	3.56	5.45	5.04	2.62	16.68
T2	4.44	5.25	4.32	0.65	14.67
T3	6.31	6.73	3.64	0.36	17.06
T4	5.57	5.63	3.86	0.88	15.95
T5	5.76	8.15	4.75	0.55	19.23
T6	7.15	6.67	2.01	0.39	16.24
T7	3.22	2.16	0.62	0.00	6.01
T8	2.62	2.52	2.19	0.99	8.33
T9	2.93	2.12	0.35	0.00	5.41
S.Em±	0.41	0.56	0.57	0.46	1.03
CD (P=0.05)	1.26	1.70	1.74	1.40	3.13

Table 5: Effect of Integrated nutrient management on tuber yield of potato for the year 2017-2018

Treatment	Tuber yield (t/ha) (2017-18)				Total tuber yield (t/ha)
	0-25g	25-50g	50-75g	>75g	
T1	3.58	5.47	5.17	2.90	17.13
T2	4.49	5.16	4.69	0.90	15.26
T3	6.44	6.79	4.22	0.48	17.94
T4	5.54	5.77	4.11	0.88	16.31
T5	6.23	8.76	5.13	0.77	20.90
T6	6.90	6.69	2.20	0.48	16.28
T7	3.44	3.25	0.71	0.03	7.44
T8	4.16	3.28	3.02	1.67	12.14
T9	2.29	1.79	0.16	0.00	4.25
S.Em±	0.13	0.13	0.33	0.22	0.50
CD (P=0.05)	0.41	0.40	1.00	0.67	1.54

Conclusion

This study indicated that application of organic manure and bio-fertilizers can minimize the only use of chemical fertilizers. This study also indicated that application of 75% RDF + 25% RDN-FYM + Boron + Azotobacter + PSB + Potash mobilizing bacteria can gives highest tuber yield (20.06 t/ha) on the basis two years pooled data.

References

- Banerjee H, Sarkar S, Roy K, Rana L, Chakraborty A. Integrated nutrient management in potato based cropping system in alluvial soil of West Bengal. *Annals of Plant and Soil Research* 2016;18(1):8-13.
- Rodríguez, Hilda, Fraga Reynaldo. Phosphate solubilizing bacteria and their role in plant growth

promotion. *Biotechnology Advances* 1999;17(4-5):319-339.

- Sethy BK, Das DK, Tarai RK, Sahoo SC, Sahoo AK, Lenka PC. Effect of Integrated nutrient management on yield and physic-chemical characteristics of papaya (*Carica papaya* L.) Cv. Coorge honey dew. *International Journal of Chemical Studies* 2019;7(5):73-76.
- Sumati Narayan, Raihana HK, Raj Narayan, Khan FA, Singh Parmeet, Rehman SU. Effect of Integrated nutrient practices on yield of potato. *Potato J* 2013;40(1):84-86.
- Vikas Kumar, Singh JP, Shivani, Himanshu Kaushik. A Study of Vermicompost, Cow Dung and Phosphate Solubilizing Bacteria on Growth and Yield of Potato (*Solanum tuberosum* L.). *Int. J Curr. Microbiol. App. Sci* 2020;9(08):184-189.