THE ASIAN JOURNAL OF HORTICULTURE
Volume **9** | Issue 1 | June, 2014 | 112-115
e ISSN- 0976-724X | Open Access-*www.researchjournal.co.in* |

Research Paper

Article history **:**
Received : 11.11.2013
Revised : 23.04.2014
Accepted : 03.05.2014

Studies on the effect of integrated nutrient management on growth and yield of plum cv. SANTA ROSA

■ **NIDHIKA THAKUR** AND **B.S. THAKUR**[1]

Members of the Research Forum

Associated Authors:
[1]Department of Fruit Science, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, SOLAN (H.P.) INDIA

Author for correspondence :
NIDHIKA THAKUR
Department of Fruit Science, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, SOLAN (H.P.) INDIA
Email :nidhika991@gmail.com

ABSTRACT : To know the response of plum to integrated nutrient management, a field experiment was conducted at the experimental farm of Horticulture Research Station, Kandaghat, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan for two successive years 2011 and 2012. The experiment was laid out in Randomized Block Design (RBD) comprised of eight treatments having various combinations of inorganic fertilizers (urea, SSP and MOP), FYM, vermicompost, biofertilizers and green manures. Among all the treatments, treatment 'T_5' (75% NPK + biofertilizers (60 g each/tree basin) + green manuring (Sunhemp @ 25 g seeds/tree basin) performed best where highest annual shoot growth (55.27 cm), tree height (4.98 m), tree volume (18.62 m^3), fruit set (77.28%), fruit yield (28.11 kg/tree), net income (Rs. 499.62) and benefit cost ratio (3.75) were observed while the highest trunk girth (71.47 cm) and leaf area (13.12 cm^2) were observed with 'T_7' (50% NPK + biofertilizers (60g each/tree basin) + green manuring (Sunhemp @ 25 g seeds/tree basin) + FYM (40 kg) + vermicompost (11.5 kg).

KEY WORDS : INM, Plum, Nutrients, Green manuring

HOW TO CITE THIS ARTICLE : Thakur, Nidhika and Thakur, B.S. (2014). Studies on the effect of integrated nutrient management on growth and yield of plum cv. SANTA ROSA. *Asian J. Hort.*, **9**(1) : 112-115.

Plum (*Prunus saliciana* Lindl.) is one of the most important stone fruits grown in temperate and subtropical areas of north India. Most of the plum is grown in the states of Himachal Pradesh, Jammu and Kashmir and Uttarakhand. Santa Rosa plum has been found to be prolific and regular bearer and is the most important table variety and is cultivated successfully in the mid hills of H.P. If proper care is taken in nutrient management by using organic manures and inorganic fertilizers, the proper growth and yield of plum trees is assured. Application of inorganic nutrients plays an important role on the yield attributes as well as uptake of nutrients at the same time. Further, the inorganic fertilizers are expensive and continuous use of these chemical fertilizers leads to the problem of soil deterioration. Organic manures alone are not able to supply all nutrients required for plant growth. However, use of proper proportion of organics along with inorganic nutrients not only helps in increasing the yield of the crop but also act as store house of nutrients besides it improves physical condition of soil Tayade *et al.* (2012). Considering the above facts, an attempt was made to find out the response of plum trees in terms of growth and yield to INM.

RESEARCH METHODS

A field trial was conducted at research farm of Horticulture Research Station, Kandaghat, Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh. The experiment was laid out in Randomized Block Design with eight treatments and three replications. The treatments were as follows : T_1:Biofertilizers (*Azotobacter*, AMF, PSB @ 60g each/tree basin) + FYM (40 kg) + vermicompost (25 kg), T_2: biofertilizers (60g each/tree basin) + green manuring (Sunhemp @ 25g seeds/tree basin) + FYM (40 kg) + vermicompost (24 kg), T_3: 75% NPK + biofertilizers (60 g each/tree basin), T_4:50% NPK + biofertilizers (60 g each/tree basin), T_5: 75% NPK + biofertilizers (60 g each/tree basin) + green manuring (Sunhemp @ 25 g seeds/tree basin), T_6:50% NPK + biofertilizers (60 g each/tree basin) + green manuring (Sunhemp @ 25 g seeds/tree basin) + FYM (40kg), T_7: 50% NPK + biofertilizers (60g each/tree basin) + green manuring (Sunhemp @ 25 g seeds/

tree basin) + FYM (40 kg) + vermicompost (11.5 kg) and T_8:500g N + 250g P + 700g K + 40 kg FYM. The chemical fertilizers (SSP and MOP) along with FYM were applied at the mid of December except N (urea) which was applied in two split dozes *i.e.* first during spring before flowering and remaining half one month after first application. Biofertilizers along with vermicompost were used one month after chemical fertilizers application. The seeds of sunhemp were sown during June. Observations on annual shoot growth, trunk girth, tree height, tree volume, leaf area and fruit yield were recorded. The data of two years were pooled and analyzed statistically as per Cochran and Cox (1963) for interpretation of results and drawing conclusions. Regarding economics of different treatments, cost incurred per tree on each treatment was worked out by calculating expenditures on variable as well as fixed inputs of each treatment. Simultaneously, gross return was also calculated by existing market rate of produce and unit fruit production of each treatment. Benefit was calculated by deducting expenditure from the gross return. Ratio of cost and benefit was then calculated for each treatment.

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation are summarized below :

Effect on growth parameters:

The results of the present investigation (Table 1 and 2) revealed that INM increased the growth parameters of plum trees. The highest annual shoot growth (55.27 cm), tree height (4.98 m) and tree volume (18.62 m^3) were observed with the application of 75% NPK + biofertilizers (60 g each/tree basin) + green manuring (Sunhemp @ 25 g seeds/tree basin), while maximum trunk girth (71.47 cm) and leaf area (13.12 cm^2) were recorded with the application of 50% NPK + biofertilizers (60g each/tree basin) + green manuring (Sunhemp @ 25 g seeds/ tree basin) + FYM (40 kg) + vermicompost (11.5 kg). Similar results were obtained by Gautam *et al.* (2012) who reported maximum vegetative growth with application of FYM and vermicompost along with chemical fertilizers. This might be due to the increased photosynthetic rate and carbohydrate accumulation as a result of multiferous role of FYM and vermicompost to allow most favorable conditions of soil with increased availability of plant nutrients responsible for better plant growth (Sharma and Bhutani, 2000; Tiwari *et al.*, 1999; Dutta *et al*., 2009); Goswami *et al.* (2012) and Pathak and Ram (2005) also observed improved vegetative growth in guava with the application of different fertilizers, organic manures and biofertilizers. This increase in tree height, spread, volume, shoot length and number of shoot emergence per branch might be attributed to the stimulative activity of microflora in the rhizosphere leading to increased nutrient availability and hence, vigorous plant growth (Singh *et al*., 2000; Aseri *et al.*, 2008). The biofertilizers inoculation helps the plants to increase

Table 1 : Effect of integrated nutrient management on growth of plum cv. SANTA ROSA

Treatments	Annual shoot growth (cm)			Trunk girth (cm)			Tree height (m)		
	2011	2012	Pooled	2011	2012	Pooled	2011	2012	Pooled
T_1 (B+FYM+V_1)	35.74	39.71	37.72	65.95	66.17	66.06	3.95	4.04	4.00
T_2(B+GM+FYM+V_2)	38.38	42.31	40.34	65.87	66.01	65.94	4.12	4.22	4.17
T_3(75% NPK+B)	43.25	45.27	44.26	66.43	67.06	66.75	4.23	4.46	4.35
T_4(50% NPK+B)	40.10	43.33	41.72	69.37	69.60	69.48	4.13	4.24	4.18
T_5 (75% NPK+B+GM)	54.26	56.29	55.27	69.43	70.05	69.74	4.95	5.00	4.98
T_6 (50% NPK+B+GM+FYM)	47.51	48.21	47.86	69.42	70.07	69.74	4.50	4.68	4.59
T_7(50% NPK+B+GM+FYM+V_1)	50.06	51.83	50.94	71.09	71.85	71.47	4.51	4.94	4.78
T_8(500gN+250gP+700gK+FYM)	45.46	46.10	45.78	70.63	70.92	70.78	4.39	4.49	4.44
C.D. (P=0.05)	0.40	0.65	0.52	3.90	2.06	3.02	0.30	0.39	0.34

* V_1-25 kg vermicompost; V_2-24 kg vermicompost; V_3-11.5 kg vermicompost
** B- Biofertilizers; GM- Green manure

Table2 : Effect of integrated nutrient management on growth and yield of plum cv. SANTA ROSA

Treatments	Tree volume (cc)			Leaf area (cm^2)			Fruit yield (kg/tree)		
	2011	2012	Pooled	2011	2012	Pooled	2011	2012	Pooled
T_1(B+FYM+V_1)	11.35	12.08	11.72	9.98	7.28	8.63	22.20	24.67	23.44
T_2(B+GM+FYM+V_2)	11.68	13.44	12.56	10.03	7.75	8.89	23.11	24.74	23.92
T_3(75%NPK+B)	13.77	14.66	14.21	10.78	9.33	10.06	24.01	24.78	24.4
T_4(50%NPK+B)	12.42	14.54	13.48	10.38	9.17	9.78	23.04	24.88	23.96
T_5(75%NPK+B+GM)	18.12	19.13	18.62	13.18	11.42	12.30	27.60	29.22	28.11
T_6(50%NPK+B+GM+FYM)	15.48	16.54	16.01	12.68	11.26	11.97	25.72	27.55	27.47
T_7(50%NPK+B+GM+FYM+V_3)	17.21	17.81	17.51	14.20	12.04	13.12	25.57	28.62	26.56
T_8(500gN-250gP+700gK+FYM)	14.02	15.52	14.77	12.27	11.17	11.72	25.05	28.53	26.79
C.D. (P=0.05)	0.49	0.55	0.50	1.64	1.67	1.60	0.95	0.64	0.78

* V_1-25 kg vermicompost; V_2-24 kg vermicompost; V_3-11.5 kg vermicompost
** B- Biofertilizers; GM- Green manure

Table3 : Economics of different treatments of integrated nutrient management

Treatments	Gross income (Rs.)			Net income (Rs.)			Benefit cost ratio		
	2011	2012	Pooled	2011	2012	Pooled	2011	2012	Pooled
T_1(B+FYM+V_1)	555.00	616.81	585.91	262.64	324.45	293.55	0.90	1.11	1.00
T_2(B+GM+FYM+V_2)	577.69	618.44	598.06	289.33	330.08	309.70	1.00	1.14	1.07
T_3(75%NPK+B)	600.25	619.56	609.91	445.37	479.55	469.90	1.82	1.92	1.87
T_4(50%NPK+B)	575.88	621.88	598.88	449.75	495.75	472.75	2.69	2.98	2.83
T_5(75%NPK+B+GM)	690.00	730.50	702.75	466.02	543.37	499.62	3.57	3.93	3.75
T_6(50%NPK+B+GM+FYM)	639.25	688.63	663.94	455.87	515.40	458.12	2.44	2.90	2.67
T_7(50%NPK+B+GM+FYM+V_3)	643.00	715.50	686.75	460.24	522.55	490.71	3.29	3.43	3.36
T_8(500gN-250gP+700gK+FYM)	626.25	713.13	669.69	435.77	470.87	479.21	2.29	2.74	2.52
C.D. (P=0.05)	23.68	15.90	19.50	21.28	11.34	14.50	0.13	0.09	0.11

* V_1-25 kg vermicompost; V_2-24 kg vermicompost; V_3-11.5 kg vermicompost
** B- Biofertilizers; GM- Green manure

the dehydrogenase, alkaline phosphatase, nitrogenase and hydrolysis enzyme activities mainly due to increase in the rhizosphere microbial population as a consequence of the inoculation treatments (Aseri and Tarafdar, 2006). The free living nitrogen fixer can affect plant growth not only by fixing nitrogen but also by altering microbial balance, solublizing fixed soil phosphorus, suppressing pathogenic micro organisms and by producing metabolites that stimulate plant development. This is an indication of the fact that biofertilizers and compost hasten the vegetative growth by virtue of their nutrient releasing properties.

Effect on yield:

The highest fruit yield (28.11 kg/ha) as presented in Table 2 was recorded with the application of 75% NPK + biofertilizers (60 g each/tree basin) + green manuring (Sunhemp @ 25 g seeds/tree basin). These findings indicated that integrated application of inorganic fertilizers, FYM, vermicompost, biofertilizers and green manures was successful in maintaining higher levels of plum productivity. The present findings of increasing fruit yield by combined application of organic manures with inorganic fertilizers are in congruence with the findings of Singh *et al.* (2012) who reported maximum fruit yield per plant of aonla with the standard doze of NPK + FYM. The increase in the yield was mainly attributed to relative increase in the availability of nutrients and better solute uptake by the plants. These findings are in accordance with the results of Korwar *et al.* (2006) and Pathak *et al.* (2005). The effectiveness of inorganic fertilizers was greatly enhanced when it was applied along with FYM, this might have resulted due to better retention of urea in root zone (Mistsui *et al*., 1960; Chin and Kroonje, 1963) and better availability of phosphate and potash to the plants by organic matter (Raychoudhuri, 1976).

Economics of different treatments :

The data in Table 3 reveal that the highest gross income (Rs. 702.75), net income (Rs. 499.62) and benefit cost ratio (3.75) was observed with the treatment T_5 which was followed by T_7 having Rs. 686.75, Rs.. 490.71 and 3.36 gross, net income and benefit cost ratio, respectively. Hence, the treatment T_5 (75% NPK + biofertilizers (60 g each/tree basin) + green manuring (Sunhemp @ 25 g seeds/tree basin) was the best for improving the tree growth, fruit yield and was also economic with more benefit cost ratio.

REFERENCES

Aseri, G.K. and Tararfdar, J.C. (2006). Fluorescein diacetate: a potential biological indicator for arid soils. *Arid Land Res. Mgmt.*, **20** : 87-89.

Aseri, G.K., Jain, N., Panwar, J., Rao, A.V. and Meghwal, P.R. (2008). Biofertilizers improve plant growth, fruit yield, nuitrition, metabolism and rhizosphere enzymes activities of pomegranate (*Punica granatum* L.) in Indian Thar desert. *Scientia Hort*., **117**: 130-35.

Chin, W.T. and Kroonje, W. (1963). Urea hydrolysis and subsequent loss of ammonia. *Proc. Soil Sci. Soc. Amer*., **27**: 316-18.

Cochran, G.C. and Cox, G.M. (1963). *Experimental design*. Asia Publishing House, Bombay. 611pp.

Dutta, P., Moji, S.B. and Das, B.S. (2009). Studies on the response of biofertilizer on growth and productivity of guava. *Indian J. Hort*., **66**: 99-42.

Gautam, U.S., Singh, R., Tiwari, N., Gurjar, P.S. and Kumar, A. (2012). Effect of integrated nutrient management in mango cv. SUNDERJA. *Indian J. Hort.,* **69**(2): 151-155.

Goswami, A.K., Shant, L. and Misra, K.K. (2012). Integrated nutrient management improves growth and leaf nutrient status of guava cv. Pant Prabhat. *Indian J. Hort.,* **69**(2): 168-172.

Korwar, G.R., Pratibha, G., Ravi, V. and Palanikumar, D. (2006). Influence of organic and inorganic on growth, yield of aonla (*Emblica officinalis*) and soil quality in semi arid tropics. *Indian J. agric. Sci.*, **76**(8): 457-461.

Mitsui, S., Namioka, H. and Mukai, N.K. (1960). Soil absorption of lurea: In: On the mechanism of ladsorption of urea. *Soil Pl. Fd.,* **6**: 25-29.

Pathak, R.K. and Ram, R.A. (2005). Integration of organic farming practice for sustainable production of guava. In: First International Guava Symposium, 5-8 Dec. 2005, CISH, Lucknow, India, pp. 144-45.

Pathak, R.K., Ram, R.A. and Shukla, S.K. (2005). Cultivating *aonla* organically. *Indian J. Hort.,* **50**: 4-9.

Raychoudhuri, S.P. (1976). Phosphatic and potassic fertilizers and their management. *Soil fertility theory and practices,* J.S. Kanwar (Ed.). ICAR, New Delhi. pp. 371-407.

Sharma, S.D. and Bhutani, V.P. (2000). Physiology of crop species systemically infected with viruses. *J. Hill Res.,* **13**(2): 63-66.

Singh, C., Saxena, S.K., Goswami, A.M. and Sharma, R. (2000). Effect of fertilizers on growth, yield and quality of sweet orange (*Citrus sinensis*) cv. MOSAMBI. *Indian J. Hort.,* **57**(2): 114-117.

Tayade, M.S., Bawkar, S.O., Kale, V.S. and Deshmukh, U.B. (2012). Integrated nutrient management in amaranthus. *Asian J.Hort.,* **7**(2): 291-293.

Tiwari, D.K., Hasan, M.A. and Chattopadhyay, P.K. (1999). Effect of biofertilizers on soil nutrient status and microbial population in banana plantation. *Environ. & Ecol.*,**17**(2):338-341.