International Journal of Pharmacy and Biological Sciences-IJPBS™ (2019) 9 (3): 1320-1323
Online ISSN: 2230-7605, Print ISSN: 2321-3272
Research Article | Biological Sciences | Open Access | MCI Approved
UGC Approved Journal

Effect of Organic Manure, Inorganic Fertilizers and Bio-Fertilizers on the Soil Health of Phalsa (*Grewia subinaequalis* D.C.)

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Received: 20 Mar 2019 / Accepted: 22 Apr 2019 / Published online: 1 Jul 2019
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Abstract

A field experiment was conducted at main experiment station, Department of Horticulture, NDUA&T Kumarganj, Faizabad (U.P.). to study the Effect of organic manure, inorganic fertilizers and bio-fertilizers on the soil health of phalsa (*Grewia subinaequalis* D.C.), results revealed that soil pH, EC, organic carbon, nitrogen, phosphorus, potassium FYM, NPK, *Azotobacter*, PSB, Zinc sulphate (0.4%) and Ferrous sulphate (0.4%)respectively.

Keywords

Soil pH, Organic Carbon, Nitrogen, Phosphorus and Potassium and Phalsa, Sharbati.

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INTRODUCTION:

Use of chemical pesticides and fertilizers not only extensively damage the beneficial microbes in the soil but also cause ill effects on human health as well as environment hazards and reduce soil fertility (Macid *et al*., 2007). The new approach to farming often referred to as sustainable agriculture, seeks to introduce agricultural practices that are ecofriendly and maintained the long-term ecological balance of the ecosystem. The judicial use of organic manure is considered as the alternative source to meet the nutrient requirement of crop.

Phalsa (*Grewia subinaequalis* D.C.) belong to family Tiliaceae.Phalsa is subtropical fruit and has high nutrition value containing iron, vitamin A and C. Its fruits possess high medicinal properties. It is a crop of arid and semi-arid regions because of its hardy nature. It comes under minor fruit crops but it is a valuable fruit. Because of these, Phalsa produces often use very large amounts of synthetic mineral

nutrients which is not sustainable due to ill effects on soil and environment a *vis.,* much involvement of non-renewable energy in production input used, attempt to improve yield and quality of crop. Keeping in view the above facts, the present experiment was conducted to study the effect of organic manure, inorganic fertilizers and bio-fertilizers on the soil health of phalsa (*Grewia subinaequalis* D.C).

MATERIALS AND METHODS:

The experiment was carried out at main experiment station, Department of Horticulture, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) for two consecutive years. Cultivar Sharbati was used to evaluate the influence of eleven treatments comprising different combinations of nutrient resources the nutrients composition of was FYM with 1 per cent N_2, 0.5 per cent P_2O_5 and 1 per cent K_2O. The amount of respective nutrient resources was calibrated on basis of different doses *vis.,* 100 per cent NPK, 75 per cent NPK and 50 per cent NPK. The experiment was laid out in Randomized Block Design with three replications in the month of January. Two plants were taken as unit per plot. Fifteen-year-old uniform Phalsa plants, planted at 3X2 m apart were taken. The recommended dose of fertilizers (100g N, 125g P, 100g K per plant) and dose of FYM was 15 kg per plant.

For estimating the yield and quality character of the phalsa fruits was done just after the picking of the fruits in the second fortnight of May.

RESULTS AND DISCUSSION:

The maximum pH (8.52 and 8.50) during first year and second year, respectively was recorded in the T_6 (FYM +75% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%) while it was minimum in T_4 (FYM +75% NPK + Azotobacter) (8.20 and 8.15 during both the years.) the study was partially supported with the findings of Magnsson (2000).

The maximum reduction in electrical conductivity was noticed in treatment T_3 (FYM +100% NPK + $FeSO_4$ (0.4%)) followed by T_6 (FYM +75% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%) The study was supported with findings of Katyal (1993).

The maximum builds up of organic carbon was noticed in treatment T_6 (FYM +75% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%) and FYM +50% NPK + Azotobacter + PSB. This tendency was observed in both the years. The result closely corroborates with the findings of Santhy *et al*. (1999).

The maximum available nitrogen (kg ha^1) was recorded in T_2 (FYM +100% NPK + $ZnSO_4$ (0.4%). While the minimum available nitrogen kg ha^1 was recorded with the application of T_5 (FYM +75% NPK + Azotobacter + PSB). These results are in resemblance with the finding of Guarishankar *et al*. (2002).

The maximum availability of phosphorus (kg ha^1) of soil was recorded in T_3 with application of FYM +100% NPK + $FeSO_4$ (0.4%) followed by T_1 FYM +100% NPK (Control). The minimum availability of phosphorus (kg ha^1) of soil was recorded in T_{11} FYM +50% NPK + Azotobacter + PSB + $FeSO_4$ (0.4%). These results are in conformity with the finding of Sharma (1999).

The maximum availability of potassium (kg ha^1) of soil was recorded in T_1 (230.20 and 236.00 during both years respectively). These results are closely related to the finding Kumar and Yadav (1995).

The maximum number of fruits per node (15.93 and 16.23 during both years respectively) and the maximum number of fruiting node per shoot (25.12 and 24.76 during both years respectively) was found with T_6FYM +75% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%)and T $_7$FYM +75% NPK + Azotobacter + PSB + $FeSO_4$ (0.4%).

The maximum fruit yield kg per plant (5.06 and 5.23 both years respectively) was obtained with T_6FYM +75% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%). Yadav *et al.* (2009).

Table 1: Effect of integrated nutrient management on Soil pH, EC(dsm^{-1}) and Organic carbon (%).

S. No.	Treatment	Soil pH		EC (dsm^{-1})		Organic carbon (%)	
		I st year	IInd year	I st year	IInd year	I st year	IInd year
T_1	FYM +100% NPK(Control)	8.32	8.26	0.28	0.27	0.58	0.60
T_2	FYM +100% NPK + $ZnSO_4$ (0.4%)	8.50	8.46	0.26	0.25	0.56	0.58
T_3	FYM +100% NPK + $FeSO_4$ (0.4%)	8.28	8.23	0.25	0.21	0.56	0.58
T_4	FYM +75% NPK + Azotobacter	8.20	8.15	0.30	0.29	0.54	0.56
T_5	FYM +75% NPK + Azotobacter + PSB	8.36	8.32	0.30	0.29	0.55	0.57
T_6	FYM +75% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%)	8.52	8.50	0.25	0.24	0.59	0.61
T_7	FYM +75% NPK + Azotobacter + PSB + $FeSO_4$ (0.4%)	8.35	8.32	0.30	0.29	0.56	0.58
T_8	FYM +50% NPK + Azotobacter	8.50	8.46	0.30	0.29	0.55	0.57
T_9	FYM +50% NPK + Azotobacter + PSB	8.50	8.45	0.28	0.27	0.59	0.61
T_{10}	FYM +50% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%)	8.38	8.33	0.27	0.26	0.57	0.59
T_{11}	FYM +50% NPK + Azotobacter + PSB + $FeSO_4$ (0.4%)	8.25	8.21	0.25	0.24	0.55	0.57
SEm±		0.026	0.061	0.004	0.002	0.010	0.008
CD at 5%		0.077	0.181	0.011	0.006	0.029	0.024

Table 2: Effect of integrated nutrient management on available N, P_2O_5 and K_2O in soil

S. No.	Treatment	N (kg/ha)		P_2O_5 (kg/ha)		K_2O(kg/ha)	
		I st year	IInd year	I st year	IInd year	I st year	IInd year
T_1	FYM +100% NPK(Control)	212.30	217.00	18.80	19.60	230.20	236.00
T_2	FYM +100% NPK + $ZnSO_4$ (0.4%)	215.50	221.30	18.30	19.00	228.60	232.30
T_3	FYM +100% NPK + $FeSO_4$ (0.4%)	214.20	220.50	19.00	20.20	230.00	235.00
T_4	FYM +75% NPK + Azotobacter	208.50	214.50	17.50	18.50	220.00	225.10
T_5	FYM +75% NPK + Azotobacter + PSB	205.00	209.00	17.80	18.70	222.50	227.20
T_6	FYM +75% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%)	210.30	216.00	18.30	19.80	220.00	225.10
T_7	FYM +75% NPK + Azotobacter + PSB + $FeSO_4$ (0.4%)	212.20	218.00	18.00	18.60	218.50	223.50
T_8	FYM +50% NPK + Azotobacter	208.40	215.00	17.20	17.90	213.00	217.20
T_9	FYM +50% NPK + Azotobacter + PSB	206.20	211.20	18.00	18.60	215.00	219.00
T_{10}	FYM +50% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%)	206.80	212.20	17.50	18.50	216.80	220.30
T_{11}	FYM +50% NPK + Azotobacter + PSB + $FeSO_4$ (0.4%)	208.30	214.50	16.80	17.40	215.20	219.40
Sem±		2.473	2.578	0.219	0.229	4.380	4.677
CD at 5%		7.294	7.606	0.645	0.676	12.922	13.798

Table 3: Effect of integrated nutrient management on No. of fruit per node, No. of fruiting node per shoot and fruit yield kg per plant

S. No.	Treatment	No. of fruit / node		No. of fruiting node / shoot		Fruit yield kg / plant	
		I st year	IInd year	I st year	IInd year	I st year	IInd year
T_1	FYM +100% NPK(Control)	12.85	12.86	11.97	12.21	3.52	3.57
T_2	FYM +100% NPK + $ZnSO_4$ (0.4%)	15.32	14.83	18.45	18.28	4.27	4.28
T_3	FYM +100% NPK + $FeSO_4$ (0.4%)	13.87	13.98	17.08	17.12	3.74	3.83
T_4	FYM +75% NPK + Azotobacter	14.39	14.44	14.59	14.80	3.74	3.83
T_5	FYM +75% NPK + Azotobacter + PSB	14.71	14.85	14.01	14.09	3.85	3.95
T_6	FYM +75% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%)	15.93	16.23	25.12	24.76	5.06	5.23
T_7	FYM +75% NPK + Azotobacter + PSB + $FeSO_4$ (0.4%)	15.48	15.60	23.22	22.82	4.39	4.48
T_8	FYM +50% NPK + Azotobacter	14.76	14.78	17.37	17.38	3.69	3.72
T_9	FYM +50% NPK + Azotobacter + PSB	15.06	15.09	17.60	17.62	3.83	3.87
T_{10}	FYM +50% NPK + Azotobacter + PSB + $ZnSO_4$ (0.4%)	15.14	15.22	21.90	21.68	3.93	4.03
T_{11}	FYM +50% NPK + Azotobacter + PSB + $FeSO_4$ (0.4%)	15.06	15.23	19.98	19.92	3.80	3.90
SEm±		0.295	0.301	0.121	0.176	0.039	0.058
CD at 5%		0.871	0.887	0.359	0.520	0.115	0.171

CONCLUSION:

The attributes of fruits with respect to soil fertility in terms of pH and was improved an organic carbon and available NPK status of the experiment field were maintained with the application of 100% FYM + 75% NPK + *Azotobacter* + PSB + $ZnSO_4$ (0.4%) (T_6). The maximum available nitrogen, phosphorus and potassium (kg ha^{1}) was recorded in T_2 FYM +100% NPK + $ZnSO_4$ (0.4%), T_3 FYM +100% NPK + $FeSO_4$ (0.4%)and T_1 FYM +100% NPK (Control) respectively. This treatment also gave maximum net return per hectare.

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