International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(3): 1160-1162

Received: 16-03-2019
Accepted: 18-04-2019

PU Bhosale
AICRP on Integrated Farming System, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

AS Dhonde
AICRP on Integrated Farming System, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

JS Kumbhar
AICRP on Integrated Farming System, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

DD Gaikwad
AICRP on Integrated Farming System, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

Correspondence
PU Bhosale
AICRP on Integrated Farming System, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

Effect of integrated nutrient management on grain, straw yield and soil fertility status after harvest of chickpea

PU Bhosale, AS Dhonde, JS Kumbhar and DD Gaikwad

Abstract
The field experiment was conducted in the Pulses Improvement Project MPKV, Rahuri, Dist. Ahmednagar during 2007-08 to -2011-12 on medium black soil to study the "Effect of Integrated nutrient management on grain, straw yield and soil fertility status after harvest of chickpea."
The experiment was laid out in randomized block design included ten treatments. The treatment were, T_1 - Absolute control, T_2 – GRD, T_3 - As per soil test, T_4 - STCRC (25 qha^{-1} target), T_5 - Vermicompost @ 2.5 tha^{-1}, T_6 - FYM @ 5 tha^{-1}, T_7 - Jeevamrut – 3 times application, T_8 - Jeevamrut – 6 times application, T_9 - 25% N-FYM + 75% RDN, T_{10} - 25% N-Vermicompost+ 75% RDN.
The pooled results (2007-08 to 2011-12), resulted that there was significant influence of different treatments on grain yield of chickpea. Application of $T_{10,}$ 25% N- Vermicompost + 75% RDN through urea treatments, gave significantly higher grain yield (2733 kgha^{-1}), which was followed by T_4, (2450 kgha^{-1}). In case of straw yield gave maximum T10, (3274 kgha^{-1}) with application of 25% N-Vermicompost + 75% RDN through urea treatments, which was followed by T_9, (2916 kgha^{-1}). The data presented revealed, that the maximum organic carbon content (0.058%), available nitrogen (240.7 kg ha^{-1}), Phosphorous (14.75 kg ha^{-1}) and potassium (531 kg ha^{-1}) was obtained by application of T_{10}, 25% N-Vermicompost + 75% RDN through urea treatments. The application of 25% N- Vermicompost + 75% RDN through urea increased the uptake of nitrogen (139.4 kg ha^{-1}), Phosphorous (42.4 kg ha^{-1}) and potassium (74.7 kg ha^{-1}), which was followed by T4, treatment with uptake of nitrogen (131.1 kg ha^{-1}), Phosphorous (38.6 kg ha^{-1}).

Keywords: Chickpea, vermicompost, chickpea, jeevamrut

Introduction
Consumer demand for organically grown the past decade, most likely because of the perceived advantages to the environment and human health. A major component of organic production is providing organic sources of nutrients to promote plant growth as well as sustain soil quality. The development of organic agriculture is receiving a lot of attention throughout the world.
The chemical fertilizers and agro-chemicals are used for increasing production of food grains but use of these chemical causes the degradation of soil and environment and human health. Pulses are valued for their importance in nutritional security, soil amelioration and sustainable crop production. Pulses play an important and diverse role in the farming systems and in the diets of poor people around the world. Besides being rich in protein, they sustain the productivity of cropping systems. Their ability to use atmospheric nitrogen through biological nitrogen fixation (BNF) is economically sound and environmentally acceptable practice. They also play an important role in protecting the environment due to their low input requirements (Ali *et al*, 2012) [1]. India produces a quarter of the worlds pulses accounting for – third of total acreage under pulses. But, India needs further increase in production to meet the requirements of its people and reduce import bill. Chickpea and field pea are important pulses crops contributing 39% and 5% respectively to the total production of pulses in the country (Bhadana *et al*. 2013) [2]. Application of organic sources of nutrient may work as the driving force in sustainable crop production while improving soil health and fertility (Singh and Singh, 2012) [10]. Keeping these views in mind, an experiment was conducted to study the "Effect of Integrated nutrient management on grain, straw yield and soil fertility status after harvest of chickpea".

Materials and method

A field experiment was conducted during rabi season of 2007-08 to 2011-12 at Pulses Improvement Project MPKV, Rahuri, Dist. Ahmednagar (M.S.). The experimental plot was homogenous in fertility having assured irrigation and other required facilities. The soil of experimental field had medium black, neutral to alkaline pH, Organic carbon, available NPK and dSm-1 electrical conductivity.

The experiment was laid out in randomized block design replicated thrice with ten treatments. The treatment were, T_1 - Absolute control, T_2 – GRD, T_3 - As per soil test, T_4 - STCRC (25 qha^{-1} target), T_5 - Vermicompost @ 2.5 tha^{-1}, T_6 - FYM @ 5 tha^{-1}, T_7 - Jeevamrut – 3 times application, T_8 - Jeevamrut – 6 times application, T_9 - 25% N-FYM + 75% RDN, T_{10} - 25% N-Vermicompost+ 75% RDN. The organic manure was applied based on recommended dose of nitrogen at 25 kgha^{-1} and Phosphorous 50 kgha^{-1} in furrow at the time of sowing. The chickpea (cv Digvijay) was sown at spacing 30 x 10 cm. The farm yard manure, vermicompost and Jeevamrut contained 0., 0., 0. N and P_2O_5respectively. In order to evaluate the initial fertility status and after harvest to know about soil properties of the experimental pot. Soil sample (0 15 cm depth) were randomly taken with help of soil auger to make a composite sample. Alkaline permanganate method (Subbiah and Asijia, 1956) [11], Olsens method (Olsens *et al*., 1954), neutral normal ammonium acetate extract using flame photometer (Jackson, 1973) [5] and Walkely and Black method (Jackson, 1967) [3] for the determination of available nitrogen, phosphorus, potassium and organic carbon, respectively. The pH and EC of experimental site was determined through 1:2.5 soil and water suspension method (Jackson, 1967) [3].

Results and discussion

The grain and straw yield were influence significantly with the application of organic sources of nutrients. However, the highest grain yield and straw yield obtained with the application of 25% N- Vermicompost + 75% RDN through urea the treatments differ significantly from each other for grain and straw yield. The pooled results (2007-08 to 2011-12) revealed that there was significant influence of different treatments on grain yield of chickpea (Table 1). The maximum grain yield (2733 kgha^{-1}) was recorded under 25% N- Vermicompost + 75% RDN through urea application to chickpea, which was followed by T_4, STCRC (25 qha^{-1} target) (2450 kgha^{-1}) over control. This increase in yield was due marked improvement in dry matter accumulation, yield attributes and greater nutrient content and their uptake by chickpea Saig and Yadav (2004) [9] and Chauhan *et al* (2010) also reported the positive effect of organic source of nutrients. Soil parameters like organic carbon, available N,P and K was increased significantly from initial stage over control treatments Table 1, revealed that the maximum straw yield (3274 kgha^{-1}) was obtained by application of T_{10} (25% RDN through vermicompost + 75% RDN through urea), which was followed by T_9, 25% N through FYM + 75% RDN through urea (2916 kgha^{-1}).

The significantly maximum organic carbon (0.58%) was accrued on application of 25% N- Vermicompost + 75% RDN through urea to chickpea while the least (0.39%) was noticed with control. Highest available nitrogen (240.7 kg ha^{-1}), phosphorus (14.75 kgha^{-1}) and potassium (531 kg ha^{-1}) was recorded with the application of 25% N- Vermicompost + 75% RDN through urea as compared to other treatments (Table1). The under Vermicompost addition might mineralization of N. Available K status in soil was improve significantly in all treatments over initial. The least gain of available nutrients recorded with control in chickpea. These results are similar to those in earlier studies of Gopinath *et al* (2008) and Saha *et al*, (2010) [8].

Significantly the highest nitrogen (139.4 kg ha^{-1}), phosphorus (42.4 kgha^{-1}) and potassium (74.7 kgha^{-1}) total uptake of nutrients was observed under (Table2) the treatment T_{10} i.e. 25% RDN through vermicompost + 75% RDN through urea which was followed by T_4, treatment with uptake of nitrogen (131.1 kg ha^{-1}),phosphorus (38.6 kgha^{-1}) and control. Positive effect of vermicompost on nutrient uptake by chickpea crop has also been reported by Jat and Ahlawat (2006) [4], Jadhav (2009) [6]. The highest uptake of nitrogen, phosphorus and potassium by chickpea was due to higher dry matter production.

The economics of integrated nutrient management (Table 3) indicated that the highest gross monetary returns (Rs. 68323 ha^{-1}), net monetary return (Rs.26391 ha^{-1}) and B:C ratio (1.63) were obtained in the treatment T_{10} (25% RDN through vermicompost + 75% RDN through urea).

Conclusion

The application of 25% N- Vermicompost + 75% RDN through urea to chickpea crop helped to increase grain yield, maintained soil fertility and increased the nutrient uptake.

Table 1: Effect of integrated nutrient management to chickpea on the grain, straw yield and soil organic carbon, available nitrogen, phosphorus and potassium content at harvest (pooled 2007-08 to 2011-12).

T. No	Treatment	Yield (kg ha^{-1})		Organic carbon (%)	Soil available nutrients (kg ha^{-1})		
		Grain	Straw		N	P	K
1	Absolute Control	1601	2094	0.39	196.9	12.29	470
2	General Recommended Dose	2180	2572	0.42	200.1	12.40	469
3	As per soil test	2383	2755	0.46	206.1	12.98	487
4	STCRC (25 qha^{-1} target)	2450	2979	0.49	202.5	14.23	482
5	Vermicompost @ 2.5 tha^{-1}	2138	2562	0.54	214.8	14.23	504
6	FYM @ 5 tha^{-1}	1977	2438	0.44	205.1	14.28	468
7	Jeevamrut – 3 times application	1949	2324	0.45	201.2	13.99	499
8	Jeevamrut – 6 times application	1969	2429	0.37	179.9	12.66	507
9	25% N-FYM + 75% RDN	2255	2916	0.53	216.2	14.10	486
10	25% N-Vermicompost + 75% RDN	2733	3274	0.58	240.7	14.75	531
	SE ±	72.5	97.6	0.028	6.64	0.543	18.73
	CD at 5%	215.3	279.8	0.084	19.05	1.566	54.04

Table 2: Effect of integrated nutrient management to chickpea on the uptake of nitrogen, phosphorous and potassium (pooled 2007-08 to 2011-12).

T. No	Treatment	Nutrient Uptake (kg ha^{-1})		
		Nitrogen	Phosphorous	Potassium
1	Absolute Control	83.35	28.5	55.91
2	General Recommended Dose	89.87	30.8	57.6
3	As per soil test	92.67	34.0	60.3
4	STCRC (25 qha^{-1} target)	131.1	38.6	63.2
5	Vermicompost @ 2.5 tha^{-1}	123.9	35.7	67.0
6	FYM @ 5 tha^{-1}	116.1	33.3	62.6
7	Jeevamrut – 3 times application	92.8	31.8	59.3
8	Jeevamrut – 6 times application	91.2	29.9	57.5
9	25% N-FYM + 75% RDN	130.5	37.5	67.4
10	25% N-Vermicompost + 75% RDN	139.4	42.4	74.7
	SE +	3.89	1.18	1.61
	CD at 5%	11.24	3.41	4.64

Table 3: Economics of integrated nutrient management for chickpea (pooled).

T. No.	Treatment	Grain yield	Straw yield	Cost of cultivation	Gross monetary return	Net monetary return	B:C ratio
		(kg ha^{-1})		(Rs.ha^{-1})			
1	Absolute Control	1601	2094	34689	40015	5326	1.15
2	General Recommended Dose	2180	2352	40636	54492	13855	1.34
3	As per soil test	2383	2615	38467	59568	21101	1.55
4	STCRC (25 qha^{-1} target)	2450	2759	38109	61260	23151	1.61
5	Vermicompost @ 2.5 tha^{-1}	2138	2681	40519	53458	12939	1.32
6	FYM @ 5 tha^{-1}	1977	2438	39035	49425	10390	1.27
7	Jeevamrut – 3 times application	1949	2544	36740	48738	11998	1.33
8	Jeevamrut – 6 times application	1969	2449	37722	49240	11518	1.31
9	25% N-FYM + 75% RDN	2255	2916	40806	56395	15589	1.38
10	25% N-Vermicompost + 75% RDN	2733	3274	41932	68323	26391	1.63
	SE +	72.5	97.6	-	1810	1810	-
	CD at 5%	215.3	279.8	-	5380	5380	-

Selling rates: Grain Rs. 25 kg^{-1}.

References

1. Ali Massod, Kumar Narendra, Ghosh PK. Milestones on agronomic research in pulses in India. Indian Journal of Agronomy. 2012; 57 (3 rd IAC):52- 57.
2. Bhadana VP, Sharma PK, Ansari MA, Baishya LK, Punitha P, Datt Shiv Prakash N *et al*. Food legumes for live hood and nutritional security in North Eastern Himalayan Region: Prospects and constraints. Indian Journal of Agricultural Sciences. 2013; 83(9):899-906.
3. Jackson ML. Soil Chemical Analysis. Prentice Hall of India, Pvt. Ltd. New Delhi, 1967, 205.
4. Jat RS, Ahlawat IPS. Direct and residual effect vermicompost, biofertilizers and phosphorus on soil nutrient dynamics and productivity of chickpea- fodder maize sequence. Journal of Sustainable Agricultural 2006; 28(1):41-42.
5. Jackson ML. Soil Chemical Analysis. Prentice Hall of India, Pvt. Ltd. New Delhi, 1973, 10-114.
6. Jadhav AB, Kadlag AD, Patil VS, Bachkar SR, Dale RM. Response of chick pea to conjoint application of inorganic fertilizers based on STCR approach and vermicompost on inceptisol. Journal of Maharashtra Agricultural Universities. 2009; 34(2):125-127.
7. Olsen SR, Cole CV, Wantanbe FS, Dean LA. Estimation of available phosphorus in soil by extract with sodium bicarbonate Govt.Printing Office Washington D.C. USAD, Circular No. 1995; 939:1-19.
8. Saha S, Gopinath KA, Mina BL, Kundu S, Bhattacharyya RA, Gupta HS. Expression of soil chemical and biological behavior on nutritional quality of aromatic rice as influenced by organic and mineral fertilization. Communication In Soil Science and Plant Analysis. 2010; 41(15):1816-13.
9. Siag RK, Yadav BS. Effect of vermicompost a fertilizers on productivity of gram (*Cicer arietinum* L.) a soil fertility. Indian Journal of Agricultural Sciences. 2004; 74(1):613-615.
10. Singh RK, Singh RP. Vermicompost: one of the key sustainable crop production. Agricultural Research and Sustainable Development in India (Singh, S.P., Shukla P., Nath, Triyugi and Kumar, R. Eds.)Bharti Publication New Delhi- 110093, 2012, 239-250.
11. Subbiah BV, Asija GL. A rapid procedure estimation of available nitrogen in soil. Current Science. 1956, 259-260.