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NUTRIENT STATUS OF SOIL AFTER HARVEST OF PIGEON PEA (*CAJANUS CAJAN* L. MILLSP.) AS INFLUENCED BY INTEGRATED NUTRIENT MANAGEMENT

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ABSTRACT

The field experiments were conducted in Agronomy Department Farm, College of Agriculture, Dapoli. Dist. Ratnagiri during *Kharif* seasons to study the "Nutrient status of soil after the harvest of pigeonpea as influenced by Intigrated nutrient Management". Results showed that available N and P content of soil after harvest of pigeonpea were improved due to all the nutrient management treatments over their respective initial values. Application of 75 % RDF + Two foliar sprays of nutrients (Potassium nitrate 1% + DAP 1% + Boron 500 ppm at flowering and 20 days after first spray) + Biofertilizers (*Rhizobium* +PSB) and RDF + Biofertilizers (*Rhizobium* + PSB) remained at par and both the treatments significantly improved the available N and P status of soil after harvest of pigeonpea crop over rest of the nutrient management treatments. the values were rather higher compared to their initial levels indicating the increased production of pigeonpea without reduction in soil fertility.

Figure : 00 References : 03 Tables : 02

KEY WORDS : *Cajanus cajan*, *Harvest*, *Nutrient* status, Soil

Introduction

Pigeonpea finds an important place in the farming systems adopted by the farmers in the large number of developing countries including India. It is grown on a wide range of soil with varying physical and chemical properties. Pigeonpea being a legume, it fixes atmospheric nitrogen. The leaf fall at maturity adds organic matter to the soil. The outstanding deep root system allows for optimum moisture and nutrients utilization which enables it to tolerate drought, the deep root system breaks the hard pans and hence it is often called as "biological plough". There is worldwide consensus that sole dependence on chemical input based agriculture is not suitable in long run and only integrated plant nutrient systems (IPNS) involving a combination of fertilizers, organic manures and biofertilizers are essential to sustain crop production, preserve soil health and soil biodiversity. Continuous use of high level of chemical fertilizers has led to problems of soil degradation, which is detrimental to pigeonpea production. Available evidences indicated that, balanced use of chemical fertilizer alone cannot improve the soil productivity and sustain soil fertility under continuous cropping, whereas inclusion of biofertilizers as well as micronutrients improves the quality yield and physical status of soil.

Material and Methods

The experiment was laid out in a split plot design with three replications during kharif seasons

TABLE- 1: Available nitrogen, phosphorus and potassium content (kg ha^{-1}) in soil after harvest of pigeonpea as influenced by different treatments

Treatments	Available N (kg ha^{-1})		Available P_2O_5 (kg ha^{-1})		Available K_2O (kg ha^{-1})	
	2012	2013	2012	2013	2012	2013
Variety						
V_1 - Konkan Tur- 1	395.09	412.80	10.33	11.19	288.57	274.71
V_2 - ICPL- 87	396.59	414.30	10.70	11.56	289.52	275.66
V_3 - Vipula	394.18	411.89	9.92	10.78	287.53	273.67
V_4 - BSMR-736	392.11	409.82	9.30	10.16	286.25	272.39
S.Em. ±	0.26	0.24	0.13	0.16	2.49	2.34
CD at 5%	0.91	0.84	0.45	0.55	N.S.	N.S.
Nutrient management						
F_1 - Control	384.38	402.09	7.08	7.94	289.83	275.97
F_2 - RDF	391.99	409.70	9.22	10.08	289.27	275.41
F_3 – RDF + Biof.	399.72	417.43	11.79	12.65	288.79	274.93
F_4 – 75 % RDF + 2 FS + Biof.	398.85	416.56	11.37	12.23	287.78	273.92
F_5 – 100 % RDF + 2 FS + Biof.	396.92	414.63	10.77	11.63	286.88	273.02
F_6 – STCR approach + Biof.	395.11	412.82	10.15	11.01	285.26	271.40
S.Em. ±	0.63	0.66	0.30	0.32	2.83	2.60
CD at 5%	1.80	1.90	0.87	0.92	N.S.	N.S.
Interaction						
S.Em. ±	1.26	1.33	0.61	0.64	0.72	0.76
C.D. at 5%	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
General mean	394.50	412.21	10.07	10.93	287.97	274.11
Initial value	376.80	9.20	309.74			

2012 and 2013.. The main plot treatments were four varieties, namely, Konkan Tur-1, ICPL-87, Vipula and BSMR-736. The sub plot treatments comprised six nutrient management treatments *viz.,* Control (F_1-No application of nutrients), RDF (F_2-25:50:00 NPK kg ha^{-1}), RDF + Biofertilizers - *Rhizobium* + PSB (F_3), 75 % RDF + Two foliar sprays of nutrients (Potassium nitrate 1% + DAP 1% + Boron 500 ppm at flowering and 20 days after first spray) + Biofertilizers - *Rhizobium* + PSB (F_4), 100 % RDF + Two foliar sprays of nutrients (Potassium nitrate 1% + DAP 1% + Boron 500 ppm at flowering and 20 days after first spray) + Biofertilizers - *Rhizobium* + PSB (F_5) and application of major and micronutrients based on soil test (NPK through soil + micronutrients through foliar spray) + Biofertilizers - *Rhizobium* + PSB (F_6). Soil of the experimental plot was sandy clay loam in texture, medium in available nitrogen (376.80 kg ha^{-1}), low in available phosphorus (9.20 kg ha^{-1}), medium in available potassium (309.74 kg ha^{-1}), high in available copper (1.89 mg kg^{-1}), low in available zinc (0.44 mg kg^{-1}) and boron (0.25 mg kg^{-1}), medium in available manganese (56.04 mg kg^{-1}) and slightly acidic in reaction (pH 5.80). The quantity of major nutrients, foliar spray of nutrients and micronutrients dose was calculated and applied in the plots as per the treatments. The foliar application of nutrients was done at flowering and 20 days after first spray as per the treatments. The rating of nutrients based on their content in soil.

Results and Discussion

Nutrient status of soil after harvest of pigeonpea

Soil available nitrogen (kg ha^{-1})

The soil available N, in general, showed marked increase during successive years as well as over initial level of 376.80 kg ha^{-1} conforming the beneficial effect of pigeonpea in increasing soil available N.

Performance of pigeonpea varieties

The available N determined after harvest of pigeonpea varieties was more compared to initial levels during both the years.

The soil available N measured after harvest of pigeonpea variety ICPL-87 recorded significantly higher available N as compared to rest of the varieties during both the years.

Effect of nutrient management

The available N status measured after harvest of pigeonpea was improved due to all the nutrient management treatments as compared to its initial levels during both the years.

Among the nutrient management treatments application RDF along with biofertilizers (F_3) and 75 % RDF + Two foliar sprays (Potassium nitrate 1% + DAP 1% + Boron 500 ppm at flowering and 20 days after first spray) along with biofertilizers (F_4) remained at par with each other and both the treatments significantly improved available N status of soil after harvest of pigeonpea over rest of the treatments during both the years.

Interaction effect

All the interaction effects were found to be non- significant.

Soil available phosphorus (kg ha^{-1})

Performance of pigeonpea varieties

The available P status of soil was improved after harvest of all the varieties of pigeonpea as compared to initial P level during both the years.

Variety ICPL-87 remained at par with Konkan Tur-1 and both varieties recorded significantly higher soil available P over Vipula and BSMR-736 during both the years except difference between Vipula and Konkan Tur-1 during 2013.

Effect of nutrient management

Treatments RDF along with biofertilizers (F_3) and 75 % RDF + Two foliar sprays (Potassium nitrate 1% + DAP 1% + Boron 500 ppm at flowering and 20 days after first spray) along with biofertilizers (F_4) remained at par with each other and both treatments significantly enhanced available P content in soil after harvest of pigeonpea over rest of the nutrient management treatments.

Interaction effect

All the interaction effects were found to be non- significant.

Soil available potassium (kg ha^{-1})

Performance of pigeonpea varieties

The soil available K determined after harvest of different pigeonpea varieties was not influenced significantly during both the years.

Effect of nutrient management

Nutrient management treatments did not influence the soil available potassium measured after harvest of pigeonpea during both the years of study.

Interaction effect

None of the interaction effects were found to

TABLE- 2 : Available copper, zinc, boron and manganese content (mg kg^{-1}) in soil after harvest of pigeonpea as influenced by different treatments

Treatments	Available Cu (mg kg^{-1})		Available Zn (mg kg^{-1})		Available B (mg kg^{-1})		Available Mn (mg kg^{-1})	
	2012	2013	2012	2013	2012	2013	2012	2013
Variety								
V_1 - Konkan Tur- 1	1.85	1.80	0.41	0.36	0.25	0.22	51.79	50.68
V_2 - ICPL- 87	1.96	1.95	0.43	0.37	0.26	0.24	52.75	51.64
V_3 - Vipula	1.76	1.74	0.38	0.34	0.23	0.20	50.67	49.56
V_4 - BSMR-736	1.66	1.64	0.37	0.33	0.20	0.18	49.29	48.18
S.Em. ±	0.12	0.10	0.02	0.01	0.01	0.02	1.07	1.03
CD at 5%	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Nutrient management								
F_1 - Control	1.94	1.91	0.44	0.39	0.27	0.26	53.99	52.88
F_2 - RDF	1.86	1.84	0.43	0.37	0.26	0.24	52.72	51.61
F_3 – RDF + Biof.	1.81	1.80	0.41	0.36	0.24	0.23	51.61	50.50
F_4 – 75 % RDF + 2 FS + Biof.	1.78	1.76	0.39	0.35	0.23	0.21	50.65	49.54
F_5 – 100 % RDF + 2 FS + Biof.	1.74	1.71	0.37	0.32	0.21	0.18	49.44	48.33
F_6 – STCR approach + Biof.	1.71	1.67	0.35	0.31	0.20	0.16	48.35	47.24
S.Em. ±	0.25	0.24	0.02	0.02	0.02	0.03	1.39	1.33
CD at 5%	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Interaction								
S.Em. ±	0.50	0.47	0.04	0.04	0.04	0.06	2.78	2.67
C.D. at 5%	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
General mean	1.81	1.78	0.40	0.35	0.23	0.21	51.12	50.01
Initial value	1.89	0.44	0.25	56.04				

be significant during both the seasons.

Soil available copper, zinc, boron and manganese (mg kg^{-1})

Performance of pigeonpea varieties

The soil available Cu, Zn, B and Mn determined after harvest of different pigeonpea varieties was not influenced significantly during both the years of experimentation.

Effect of nutrient management

Nutrient management treatments did not influence the soil available copper, zinc, boron and manganese measured after harvest of pigeonpea during both the years.

Interaction effect

None of the interaction effects were found to be significant during both the seasons.

The data on soil available N and P after harvest of pigeonpea showed an levels increase under all the nutrient management treatments over their initial levels during both the years. The increase in available N and P after harvest of pigeonpea might be due to additation of these nutrients through inorganic fertilizers and their angumentation due to *Rhizobium* and phosphorus solubilizing bacteria. The similar results were reported[1,2,3]. The available K, Cu, Zn, B and Mn contents in soil after harvest of pigeonpea were not influenced significantly due to nutrient management treatments, however, there concentration was slightly reduced compared to initial levels as there was no any additation of these nutrients through soil.

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