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## Effect of natural farming practices on N, P K content in seed and haulm of cowpea (*Vigna unguiculata* (L.))

**Pinky Yadav, SK Sharma, Sonal Athnere, Suman Dhayal, Vijay Laxmi Yadav, Anshul Sharma and Sundar Anchra**

### Abstract

Natural Farming (NF), as the name indicates, is a farming method where the cost of crop production is minimum. The farmers need not purchase external inputs like chemical fertilizers and pesticides to grow food. The key objective of the NF is to improve soil fertility and to protect the environment. NF is cost effective, Minimum risk farming practice and a climate sustainable model work in parallelism. In recent decades, many of the Indian states have adopted NF system and realized its importance in maintaining soil bio-life and farmers income. Experiments were conducted at RCA Udaipur during *kharif*, 2020 and 2021. The trial comprised 9 different crop management practices *viz.*, T<sub>1</sub>-(Control), T<sub>2</sub>-Complete NF (1. Beejamrit + Ghanjeevamrit + Jeevamrit; 2. Crop residue mulching 3. Intercropping 4. Whapasa), T<sub>3</sub>-NF without 1 T<sub>4</sub>-NF without 2 T<sub>5</sub>-NF without 3, T<sub>6</sub>-NF without 4, T<sub>7</sub> (AI-NPOF) package, T<sub>8</sub> – Integrated Crop Management (50% organic + 50% inorganic) without chemical pesticide and T<sub>9</sub>-[ICM (50% organic + 50% inorganic) with chemical pesticide and replicates three time in randomized block design. The result revealed that N, P and K % in seed and haulm was recorded with T<sub>9</sub> However, its was statistically on par with treatment T<sub>8</sub> and T<sub>7</sub>.

**Keywords:** Jeevamrit, integrated crop management, natural farming, cowpea

### Introduction

Natural farming, known as "the Fukuoka Method," "the natural way of farming," or "do-nothing farming," is an sustainable approach to agriculture pioneered by Masanobu Fukuoka, (Fukuoka, 1987) [3]. This method, promoting flourishing of diverse plant and animal life within the ecosystem alongside food crops. In modern times, the primary aim of promoting natural farming is to eliminate the application of chemical fertilizers and pesticides while advocating for sustainable agronomic practices. The goal is to produce agricultural goods free from harmful chemicals while restoring soil fertility and organic matter through eco-friendly processes. This concept of modern natural farming is rooted in traditional agricultural practices and agro-ecological principles, promoting a sustainable food system and way of life. Natural farming systems are water-efficient and environmentally friendly. In India, the promotion of natural farming is facilitated through the Bharatiya Prakritik Krishi Paddhati Programme (BPKP) (NITI Aayog, Government of India, 2020). India is a significant producer of pulses, which serve as a vital protein source for many vegetarians. Cowpea is a crucial *Kharif* pulse crop, used for grain, animal fodder, or as a vegetable. Its nutritious seeds contain protein, carbohydrates, fat, fiber, thiamine, riboflavin, and niacin (Davis *et al.*, 2000) [1]. Additionally, cowpea's broad, droopy leaves provide shading, conserving soil and moisture.

### Materials and Methods

Experiments were conducted at RCA, Udaipur which is located in South Eastern part of Rajasthan at an altitude of 581.16 meter above mean sea level with 24°35' N latitude and 72°42' E longitude in agro-climatic zone IV-a of Rajasthan. The experiment comprising 9 treatments of different crop management practices *viz.*, T<sub>1</sub>, T<sub>2</sub>-Complete NF (1. Beejamrit +Ghanjeevamrit + Jeevamrit; 2. Crop residue mulching 3. Intercropping 4. Whapasa), T<sub>3</sub>-NF without 1 T<sub>4</sub>-NF without 2 T<sub>5</sub>-NF without 3, T<sub>6</sub>-NF without 4, T<sub>7</sub>-(AI-NPOF) package, T<sub>8</sub> – Integrated Crop Management (50% organic 50% inorganic) without chemical pesticide and T<sub>9</sub>-[ICM Integrated Crop Management (50% organic 50% inorganic with chemical pesticide and replicates three time in randomized block design.

At harvest, seed and haulm samples were taken from each plot and dried in an oven at 65 °C until they reached a consistent weight. These samples were crushed in a laboratory mill, sieved through a 40 mm mesh sieve, and utilised to calculate the N, P, and K concentrations. The conventional methods of analysis listed below were employed. Nitrogen: colorimetric technique based on Nessler's reagent (Snell and Snell, 1949) [6]. Jackson (1973) [4] developed an ammonium vanadomolybdate phosphoric yellow colour technique for phosphorus. Flame photometric technique for potassium (Jackson, 1973) [4].

## Result and Discussion

### Nutrient Content

#### Nitrogen Content

Data (Table 1) show that diverse crop management practices significantly improved nitrogen percent in seed and haulm during 2020 and 2021 inquiry and pooled analysis. Results presented in the Table 1 reveal that the N content, in cowpea were found significantly higher in treatment T<sub>9</sub> as compared to natural farming practices (T<sub>2</sub>toT<sub>6</sub>). However, the effect of T<sub>9</sub> on these the parameters was statistically on par with treatment T<sub>7</sub> and treatment T<sub>8</sub>. The treatments that received a combination of organic (50%) and inorganic (50%) with chemical pesticide had a greater nitrogen concentration than the natural farming treatments. This can be ascribed to an increase in the availability of these nutrients in soil as a result of the combined addition of organic and inorganic nutrient sources, as well as the conversion of unavailable nitrogen forms into accessible ones. Debele *et al.* (2001) [2] observed similar findings. They found that applying enriched FYM (@ 8 t ha<sup>-1</sup>) with urea resulted in greater nitrogen utilization by the maize crop. Kler and Walia (2006) [5] showed a greater N, P, and K content in maize crop with FYM application @ 20 t ha<sup>-1</sup> as compared to the treatment with no FYM in a maize-wheat cropping system.

#### Phosphorus Content

A data analysis (Table 2) indicates that crop management practices substantially influenced phosphorus content in seed and haulm during both years of experiment and in pooled analysis. The maximum phosphorus content in seed and haulm was registered under treatment T<sub>9</sub> its was found on par with treatment T<sub>7</sub> and T<sub>8</sub>.

#### Potassium Content

A significant remark from the data provided in Table 3 demonstrates that different crop management practices considerably altered potassium content in seed and haulm in cowpea over the 2020 and 2021 investigation periods, on a pooled data basis. The maximum potassium % in seed and haulm was registered under treatment T<sub>9</sub> its was found at par with treatment T<sub>7</sub> and T<sub>8</sub>.

**Table 1:** Nitrogen content in seed and haulm of cowpea as influenced by different natural farming practices

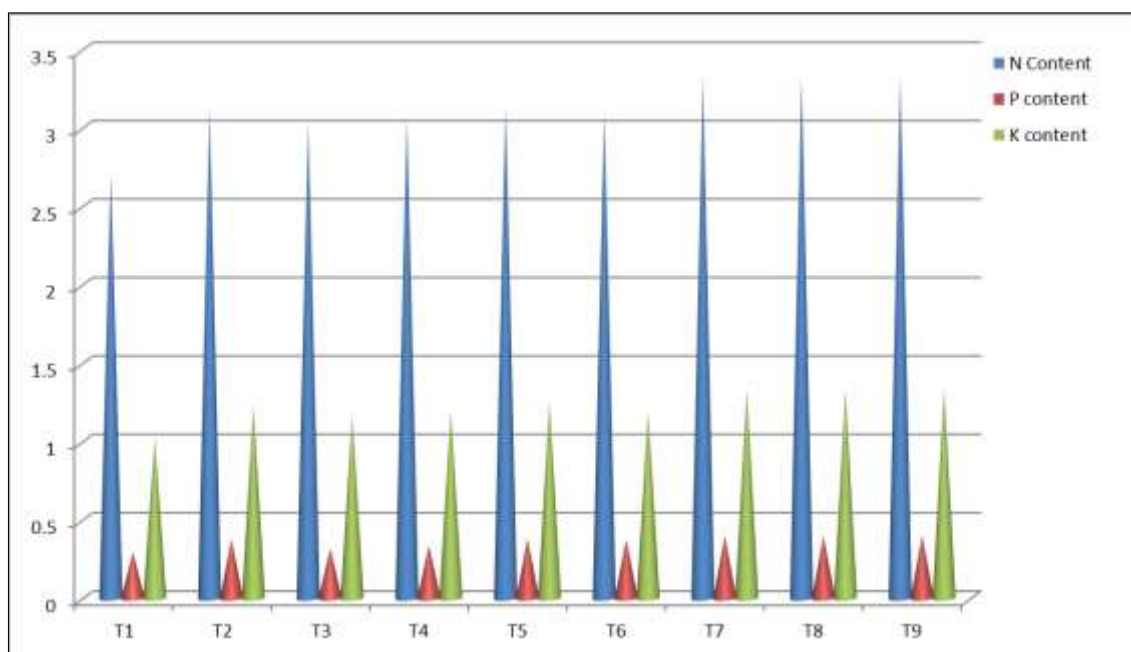
Treatments	Nitrogen content (%)					
	Seed			Haulm		
	2020	2021	Pooled	2020	2021	Pooled
T <sub>1</sub>	2.740	2.680	2.710	1.094	1.025	1.059
T <sub>2</sub>	3.100	3.145	3.122	1.180	1.249	1.214
T <sub>3</sub>	3.030	3.039	3.035	1.120	1.130	1.125
T <sub>4</sub>	3.040	3.097	3.069	1.140	1.200	1.170
T <sub>5</sub>	3.111	3.187	3.149	1.190	1.280	1.235
T <sub>6</sub>	3.080	3.130	3.105	1.180	1.221	1.200
T <sub>7</sub>	3.310	3.325	3.318	1.420	1.425	1.423
T <sub>8</sub>	3.300	3.360	3.330	1.400	1.461	1.431
T <sub>9</sub>	3.293	3.389	3.341	1.390	1.485	1.438
S.Em±	0.049	0.069	0.042	0.031	0.038	0.024
CD (P=0.05)	0.146	0.207	0.122	0.094	0.113	0.071

**Table 2:** Phosphorus content in seed and haulm of cowpea as influenced by different natural farming practices

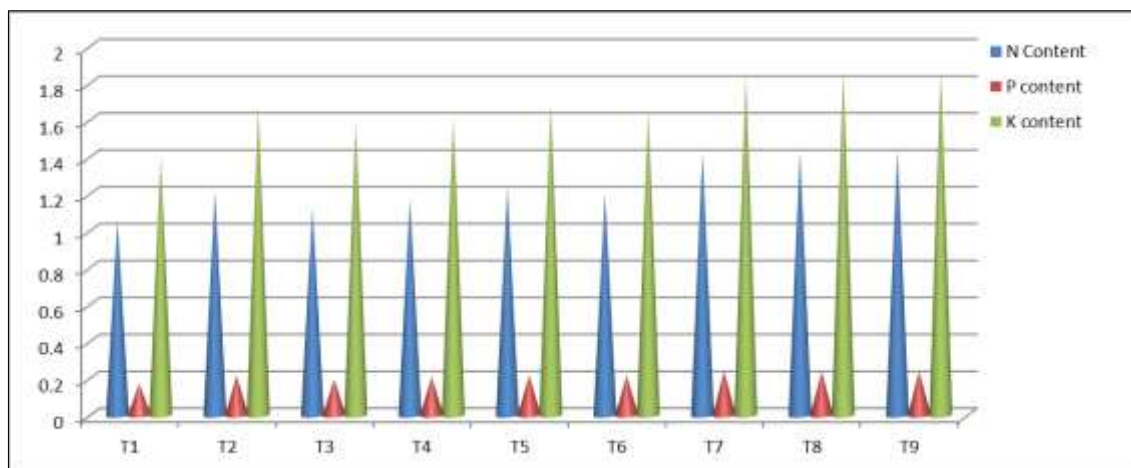
Treatments	Phosphorus content (%)					
	Seed			Haulm		
	2020	2021	Pooled	2020	2021	Pooled
T <sub>1</sub>	0.309	0.285	0.297	0.175	0.169	0.172
T <sub>2</sub>	0.377	0.380	0.379	0.214	0.219	0.216
T <sub>3</sub>	0.321	0.322	0.321	0.194	0.196	0.195
T <sub>4</sub>	0.338	0.340	0.339	0.209	0.211	0.210
T <sub>5</sub>	0.380	0.385	0.383	0.216	0.220	0.218
T <sub>6</sub>	0.377	0.379	0.378	0.213	0.218	0.216
T <sub>7</sub>	0.397	0.400	0.399	0.236	0.241	0.239
T <sub>8</sub>	0.396	0.403	0.400	0.235	0.240	0.237
T <sub>9</sub>	0.395	0.408	0.401	0.234	0.246	0.240
S.Em±	0.004	0.005	0.003	0.002	0.003	0.002
CD (P=0.05)	0.012	0.016	0.009	0.005	0.010	0.006

**Table 3:** Potassium content in seed and haulm of cowpea as influenced by different natural farming practices

Treatments	Potassium content (%)					
	Seed			Haulm		
	2020	2021	Pooled	2020	2021	Pooled
T <sub>1</sub>	0.992	1.051	1.022	1.402	1.394	1.398
T <sub>2</sub>	1.170	1.295	1.232	1.642	1.680	1.661
T <sub>3</sub>	1.137	1.202	1.169	1.572	1.590	1.581
T <sub>4</sub>	1.146	1.236	1.191	1.602	1.626	1.614
T <sub>5</sub>	1.207	1.315	1.261	1.662	1.719	1.691
T <sub>6</sub>	1.160	1.234	1.197	1.642	1.664	1.653
T <sub>7</sub>	1.290	1.368	1.329	1.840	1.854	1.847
T <sub>8</sub>	1.267	1.394	1.331	1.817	1.903	1.860
T <sub>9</sub>	1.262	1.418	1.340	1.825	1.913	1.869
S.Em±	0.018	0.021	0.014	0.031	0.054	0.031
CD (P=0.05)	0.053	0.063	0.039	0.094	0.162	0.090



**Fig 1:** N, P and K Content (%) in seed of cowpea as influenced by different natural farming practices



**Fig 2:** N, P and K Content (%) in haulm of cowpea as influenced by different natural farming practices

### Conclusion

Based on the findings, it is determined that Integrated Crop Management, with or without chemical pesticides, was the most beneficial in improving the nutritional condition of cowpea seed and haulm.

### Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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