Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 03, Issue: 04 (JULY-AUGUST, 2023)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Enhancing Cowpea Yield and Nutrient Uptake through Organic Foliar Nutrition: A Comprehensive Field Study

(*Mr. A. Kaviarasan[1] and Dr. R. Krishnamoorthy[2])
[1]Assistant Professor, Palar Agricultural College, Vellore
[2]Assistant Professor, Department of Agronomy, Annamalai University, Chidambaram
*Corresponding Author's email: kavipac17@gmail.com

Abstract
This study delves into the pivotal role of pulses, particularly cowpea, as a vital global food crop and an integral part of Indian agriculture. Cowpea's adaptability and multifunctional attributes make it a cornerstone in farming systems. The research investigates the impact of organic foliar nutrition on cowpea growth and yield through a meticulous field experiment. Various treatments were administered, and nutrient uptake was analyzed. The seaweed extract spray combined with the Jeevamirtham treatment exhibited exceptional nutrient uptake due to increased dry matter production and efficient nutrient absorption. These findings underscore the significance of foliar nutrients in enhancing root growth and nutrient assimilation, contributing to sustainable farming practices, and having potential agricultural implications.

Keywords: Cowpea, organic foliar nutrition, nutrient uptake, sustainable farming, Seaweed extract, Jeevamirtham.

Introduction
The pivotal role of pulses as a crucial global food crop and a staple in the Indian diet stems from their high protein content and the presence of essential amino acids. In the Indian context, pulses are often referred to as both the "poor man's meat" and the "rich man's vegetable. Integrated seamlessly into diverse agricultural practices such as crop rotation, mixed cultivation, and fallow cropping, pulses are a cornerstone of farming systems across the nation. Among these, cowpea, commonly known as 'labia,' stands out as a versatile crop, serving as a pulse, green vegetable, fodder, and green manure source. Thriving across a wide range of soil types and tropical to subtropical climates, cowpea showcases adaptability to varied conditions. This research article delves into the multifaceted significance of pulses, particularly cowpea, as a nutritional powerhouse and essential agricultural resource. By exploring the plant's growth patterns, nutritional attributes, and global cultivation, the study aims to shed light on strategies for bolstering yield and nutrient uptake. In this pursuit, the research was meticulously conducted to unravel the intricate processes governing nutrient uptake by cowpea. Through this investigation, the article seeks to contribute to enhanced agricultural sustainability and productivity by offering insights into optimising nutrient utilisation and fostering resilient crop growth.

Materials and Methods
The study conducted a field experiment in the Pappireddipatti village of Dharmapuri district from March to April 2017, aiming to assess the influence of organic foliar nutrition on

cowpea's growth and yield. The experiment involved meticulous material selection and methodology implementation. Situated at 11° 91' North Latitude and 78° 36' East Longitude, with an altitude of + 914 m above sea level, the location experienced warm temperatures conducive to cowpea cultivation. The experimental site featured clay loam soil, characterized by specific physico-chemical properties. The selected cowpea variety was Co(CP) 7 seeds. Employing a randomized block design, the study incorporated nine treatments, designated as follows: T1 - Control, T2 - Panchakavya spray @ 3% at 25 DAS and 45 DAS, T3 - Vermiwash spray @ 25% at 25 DAS and 45 DAS, T4 - Seaweed extract spray @ 5 ml/L at 25 and 45 DAS, T5 - Jeevamirtham @ 3% at 25 and 45 DAS, T6 - Humic acid @ 0.6% at 25 and 45 DAS, T7 - Panchakavya spray @ 3% + Vermiwash spray @ 25% at 25 and 45 DAS, T8 - Seaweed extract spray @ 5 ml/L + Jeevamirtham @ 3% at 25 and 45 DAS, T9 - Vermiwash spray @ 25% + Jeevamirtham @ 3% at 25 and 45 DAS. The research methodology encompassed organic nutrient application, appropriate seed treatment, sowing, and comprehensive crop management practices. Notably, distinct foliar sprays were administered at specific growth stages for each treatment. After harvesting, plant analysis included the following methods for nutrient estimation:

- **Nitrogen Uptake**: The nitrogen content in crop samples was determined using the Microkjeldhal method following the approach suggested by Yoshida et al., (1976), and the results were expressed in kg $ha^{-1.}$
- **Phosphorus Uptake**: Phosphorus content was estimated using the triple acid digestion method as described by Jackson (1973), with a photoelectric calorimeter. The phosphorus content in the crop was calculated from the standard curve and expressed in kg $ha^{-1.}$
- **Potassium Uptake**: The potassium content of crop samples was estimated using the triple acid extract method described by Jackson (1973) and measured using a flame photometer. The potassium content was determined from the standard curve and expressed in kg $ha^{-1.}$

This robust methodology enabled comprehensive exploration of the effects of organic foliar nutrition on cowpea's growth and yield, including the intricate interplay of essential nutrients.

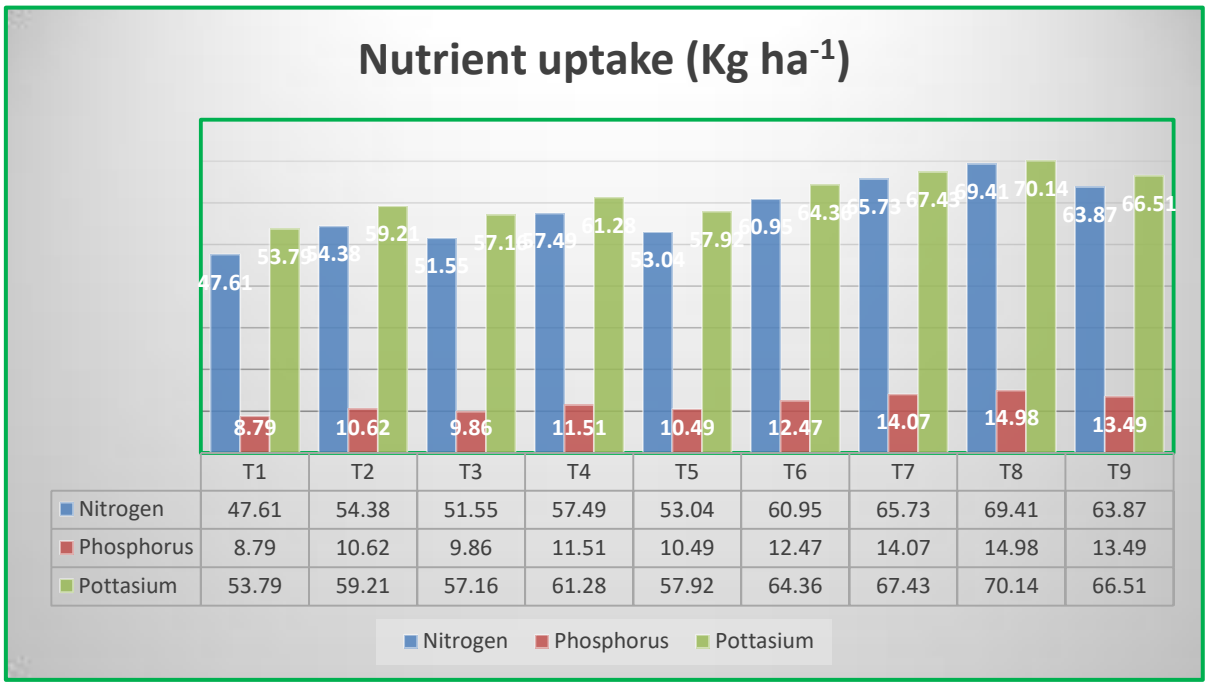
Results and Discussion

The investigation into nutrient uptake by the crop, as detailed in Tables 1., provides insightful results. Notably, the foliar nutrition strategy involving Seaweed extract spray @ 5ml/l + Jeevamirtham @ 3% at 25 and 45 DAS (T8) emerged as exceptionally effective, showcasing significantly elevated nutrient uptake levels of 69.41 kg ha^{-1} for nitrogen, 14.98 kg ha^{-1} for phosphorus, and 70.14 kg ha^{-1} for potassium. Similarly, treatments T7 and T9 exhibited comparable outcomes, standing as the next most promising options. Following suit, the application of humic acid @ 0.6% at 25 and 45 DAS (T6) yielded favourable results. On the contrary, the control treatment (T1) demonstrated the least nutrient uptake, registering values of 47.61 kg ha^{-1} for nitrogen, 8.79 kg ha^{-1} for phosphorus, and 53.79 kg ha^{-1} for potassium. Remarkably, the foliar nutrition approach of Seaweed extract @ 5ml/l + Jeevamirtham @ 3% at 25 and 45 DAS (T8) also exhibited the highest absorption of available nitrogen, phosphorus, and potassium. This outcome could be attributed to the amplified Dry Matter Production (DMP) of the crop. Facilitated availability and absorption of foliar nutrients within the plant system contributed to robust crop growth, thereby fostering enhanced nutrient uptake and efficient nutrient translocation through the foliage. Notably, foliage-applied nutrients played a pivotal role in stimulating root growth, thereby bolstering the crop's capacity to absorb nutrients from the soil. In contrast, the control treatment (T1) demonstrated lower nutrient uptake, owing to insufficient nutrient supply, particularly nitrogen and phosphorus. These findings align with prior studies conducted by Turan and

Kose (2004) and Rathore et al. (2009), substantiating the vital role of foliar nutrition in augmenting crop nutrient uptake.

Table.1. Effect of organic foliar nutrition on nitrogen, phosphorus, potassium uptake (kg ha^{-1})

Treatments	Nitrogen uptake (kg ha^{-1})	Phosphorus uptake (kg ha^{-1})	Potassium uptake (kg ha^{-1})
T_1- Control	47.61	8.79	53.79
T_2 - Panchakavya spray @ 3% at 25 DAS and 45 DAS	54.38	10.62	59.21
T_3 - Vermiwash spray @ 25% at 25 DAS and 45 DAS	51.55	9.86	57.16
T_4 - Seaweed extract spray @ 5 ml/L at 25 and 45 DAS	57.49	11.51	61.28
T_5 - Jeevamirtham @ 3% at 25 and 45 DAS	53.04	10.49	57.92
T_6 - Humic acid @ 0.6% at 25 and 45 DAS	60.95	12.47	64.36
T_7 - Panchakavya spray @ 3% + Vermiwash spray @ 25% at 25 and 45 DAS	65.73	14.07	67.43
T_8 - Seaweed extract spray @ 5 ml/L + Jeevamirtham @ 3% at 25 and 45 DAS	69.41	14.98	70.14
T_9 - Vermiwash spray @ 25% + Jeevamirtham @ 3% at 25 and 45 DAS	63.87	13.49	66.51
SE_d	1.31	0.41	0.89
CD(p=0.05)	2.79	0.87	1.89



Conclusion

This research highlights the importance of organic foliar nutrition in enhancing cowpea growth and yield. The Seaweed extract spray combined with Jeevamirtham treatment demonstrated remarkable nutrient uptake, attributed to increased Dry Matter Production and improved nutrient absorption. These findings emphasize the role of foliar nutrients in stimulating root growth and nutrient assimilation. By showcasing the efficacy of modern agricultural approaches, the study contributes to sustainable farming practices, with potential implications for global food security and agricultural sustainability.

References

1. Paul Sebastian, S and A. Christopher Lourdraj. 2007. Effect of organic manures and foliar spray on nutrient uptake and leaf biochemical properties in plant. **Int.** Patil, S.M., A.V. Kaimar, H.M. Patil and C.B. Gaolwad. 2008. Response of potash and foliar spray of cow urine on growth and yield of summer greengram (*Vigna radiata* L.). **Int. J. Agric. Sci., 4**(2): 446-449.
2. Ahmad Asgharzade and Mahdi Babaeian. 2012. Investigating effect of humic acid foliar application on yield and nutrient uptake of blackgram. **African J. Microbiol. Res., 6**(31): 6049-6054.
3. Ali kahraman. 2017. Effect of humic acid does on yield and quality parameters of cowpea (vigna unguiculata L. Walp) cultivars. **Legume. Res., 40** (1):155-159.
4. Ebrahim Azarpour, Reza Khosravi Danesh, Shirin Mohammadi. 2011. Effects of nitrogen fertilizer under foliar spraying of humic acid on yield and yield components of cowpea (*Vigna unguiculata*). **World applied sci. J., 13(**6): 1445-1449.
5. Magdi, T.A., E.M. Selim and A.M. El-Ghamry. 2011. Integrated effects of bio and mineral fertilizer and humic substances on growth, yield and nutrient contents of fertigated cowpea (*Vigna unguiculata* L.). **Ind. J. Agron., 56**(1): 34-39.
6. Yoshida, S.D., A. Forno. J.H. Cook and K.A. Gomez. 1976. Laboratory manual for physiological studies of rice, 3rd edition, **IRRI**, Philippines, pp. 7-76.
7. Jackson, M.L. 1973. Soil chemical analysis, Prentic Hall of India Pvt. Ltd., New Delhi.