



Effect of Irrigation Scheduling and Foliar Organic Nutrition on Growth and Yield of Summer Groundnut (*Arachis hypogaea L.*)

Elukur Karthik ^{a++*}, Rajesh Singh ^{a#}, Indu Thakur ^{a†}
and Akankhya Pradhan ^{a†}

^a Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences (Deemed to be University), Prayagraj, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted during summer season of 2022 at Crop Research Farm (CRF). Department of Agronomy, SHUATS, Prayagraj (UP) on soil with sandy loam in texture with Organic carbon 0.48%, Available Nitrogen 278.93 Kg/ha, Available Phosphorus 19.03 Kg/ha, Available Potassium 238.1 Kg/ha, Soil Ph 7.4, EC 0.47 ds/m to investigate the effect of irrigation scheduling and foliar organic nutrition on growth and yield of Zaid Groundnut. The treatments consist of three irrigation schedulings viz., I₁: 3 irrigations (25,45,70 DAS), I₂: 2 irrigations (25,45 DAS), I₃: 2 irrigations (25,70 DAS) and three foliar organic nutrition F₁ – Panchagavya at 3%, F₂ – Jeevamrutha

⁺⁺ M. Sc Scholar;

[#] Associate Professor;

[†] PhD. Scholar;

*Corresponding author: E-mail: elukurkarthik4410@gmail.com;

at 3%, F₃ – Panchamrutha at 3% whose effect is observed on Groundnut (var. Kadiri-6). The experiment was laid out in randomized block design with ten treatments replicated thrice. The treatment with application of 3 irrigations (25,45,70 DAS) + panchagavya-3% recorded significantly higher plant height (60.07cm) and plant dry weight (39.62 g), number of pods per plant (20.33), number of kernels per pod (2.47), seed index (39.84 g), pod yield (2.85 t/ha) and haulm yield (4.4 t/ha) compared to other treatment combinations. It is concluded that 3 irrigations (25,45,70 DAS) and panchagavya-3% accomplished better growth parameters, yield attributes and higher pod yield in groundnut crop.

Keywords: Groundnut; irrigation scheduling; panchagavya; jeevamrutha; panchamrutha growth; yield.

1. INTRODUCTION

Among various oilseed crops grown in India, groundnut is the major oil seed crop and it plays a major role in bridging the vegetable oil deficit in the country. Groundnuts in India are available throughout the year due to a two-crop cycle harvested in March and October. Ground Nuts are important protein crops in India grown mostly under rain-fed conditions. Peanut or groundnut (*Arachis hypogaea* L.), is a species in the legume or "bean" family. The peanut was probably first domesticated and cultivated in the valleys of Paraguay. It is an annual herbaceous plant growing 30 to 50 cm (1.0 to 1.6 ft) tall. The leaves are opposite, pinnate with four leaflets (two opposite pairs; no terminal leaflet), each leaflet 1 to 7 cm long and 1 to 3 cm broad.

In 2020, world production of peanuts (reported as groundnuts in shells) was 54 million tons, an 8% increase over 2019 production. China had 34% of global production, followed by India (19%). Other significant producers were Nigeria, the United States, and Sudan. India is the second largest producer of groundnuts in the world. Indian groundnuts are available in different varieties: Bold or Runner, Java or Spanish and Red Natal. Major Growing States of ground nut are Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Rajasthan, Madhya Pradesh, Orissa, and Uttar Pradesh. India has exported 638,582.97 MT of groundnuts to the world for the worth of Rs. 5,381.61 Crores/ 727.40 USD Millions during the year 2020-21 (APEDA).

Water has an impact on crop performance not only directly, but also indirectly by influencing the availability of other nutrients, the timing of cultural operations, and so on. Water and other inputs to production interact with one another. Crop yields can be increased significantly by using the right combinations in irrigated agriculture. It has a significant impact on

photosynthesis, respiration, absorption, translocation, and utilization of universal nutrients, as well as cell division and other processes. Its scarcity and abundance have an impact on plant growth and development, yield, and produce quality. Numerous benefits of organic manures include a balanced supply of nutrients, increased soil nutrient availability because of increased soil microbial activity, the decomposition of hazardous components, improved soil structure and root development, and greater soil water availability. To reduce the impact of synthetic fertilizers on soil health, environment and to maintain ecological biodiversity, sustainable farming with organic inputs is must. Hence this research is involved to find proper irrigation scheduling along with foliar application of liquid organic manures in summer groundnut.

2. MATERIALS AND METHODS

A field experiment was conducted during summer season of 2022 at Crop Research Farm (CRF), Department of Agronomy, SHUATS, Prayagraj (UP). The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.4), medium in organic carbon (0.48%), medium in available Nitrogen (278.93 kg/ha), low in available Phosphorous (19.03 kg/ha) and medium in available Potassium (238.1 kg/ha). The treatments consist of three irrigation schedulings viz., I₁: 3 Irrigations (25,45,70 DAS Days After Sowing), I₂: 2 Irrigations (25,45 DAS), I₃: 2 Irrigations (25,70 DAS) and three foliar organic nutrition F₁ – Panchagavya at 3%, F₂ – Jeevamrutha at 3%, F₃ – Panchamrutha at 3% whose effect is observed on Groundnut (var. K-6). The experiment was laid out in randomized block design with ten treatments replicated thrice. The experiment comprising ten treatment possible combination of above factor are represented in Table 1 Observations regarding growth and yield attributes was recorded during the field experiment and analysed statistically.

Table 1. Details of treatment combination

Sl. No.	Treatment No.	Treatment Combination
1	T ₁	3 Irrigations (25,45,70 DAS) + panchagavya-3%
2	T ₂	3 Irrigations (25,45,70 DAS) + Jeevamrutha-3%
3	T ₃	3 Irrigations (25,45,70 DAS) + Panchamrutha-3%
4	T ₄	2 Irrigations (25,45 DAS) + panchagavya-3%
5	T ₅	2 Irrigations (25,45 DAS) + Jeevamrutha-3%
6	T ₆	2 Irrigations (25,45 DAS) + Panchamrutha-3%
7	T ₇	2 Irrigations (25,70 DAS) + Panchagavya-3%
8	T ₈	2 Irrigations (25,70 DAS) + Jeevamrutha-3%
9	T ₉	2 Irrigations (25,70 DAS) + Panchamrutha-3%
10	T ₁₀	Control

Table 2. Growth attributes of Groundnut at harvest as influenced by Irrigation Scheduling and Foliar Organic Nutrition

Treatments	Plant Height (cm)	Plant Dry Weight (g)	CGR (g/m ² /day)	RGR (g/g/day)
3 Irrigations (25,45,70 DAS) + panchagavya-3%	60.07	39.62	14.40	0.0133
3 Irrigations (25,45,70 DAS) + jeevamrutha-3%	59.37	38.47	14.21	0.0136
3 Irrigations (25,45,70 DAS) + panchamrutha-3%	58.43	37.79	14.34	0.0140
2 Irrigations (25,45 DAS) + panchagavya-3%	57.53	36.84	13.48	0.0134
2 Irrigations (25,45 DAS) + jeevamrutha-3%	57.19	36.67	13.53	0.0136
2 Irrigations (25,45 DAS) + panchamrutha-3%	56.39	36.26	13.30	0.0135
2 Irrigations (25,70 DAS) + panchagavya-3%	55.64	35.82	13.29	0.0137
2 Irrigations (25,70 DAS) + jeevamrutha-3%	55.17	35.53	13.29	0.0138
2 Irrigations (25,70 DAS) + panchamrutha-3%	54.49	35.20	13.47	0.0142
Control	53.1	33.21	12.27	0.0136
F test	S	S	S	S
SEm(±)	0.06	0.04	0.06	0.00
CD (p=0.05)	0.17	0.12	0.18	0.00

Table 3. Yield attributes of Groundnut at harvest as influenced by Irrigation Scheduling and Foliar Organic Nutrition

Treatments	Yield attributes		
	No. of pods/plant	No. of kernels/ pod	Seed Index (g)
3 Irrigations (25,45,70 DAS) + panchagavya-3%	20.33	2.47	39.84
3 Irrigations (25,45,70 DAS) + jeevamrutha-3%	19.67	2.27	38.70
3 Irrigations (25,45,70 DAS) + panchamrutha-3%	19.53	2.07	38.95
2 Irrigations (25,45 DAS) + panchagavya-3%	18.87	2.00	38.91
2 Irrigations (25,45 DAS) + jeevamrutha-3%	18.40	1.87	38.74
2 Irrigations (25,45 DAS) + panchamrutha-3%	18.27	1.73	38.65
2 Irrigations (25,70 DAS) + panchagavya-3%	18.13	1.60	38.15
2 Irrigations (25,70 DAS) + jeevamrutha-3%	17.53	1.60	38.14
2 Irrigations (25,70 DAS) + panchamrutha-3%	17.47	1.60	38.14
Control	15.47	1.40	36.54
F test	S	S	NS
SEm(±)	0.06	0.05	0.56
CD (p=0.05)	0.19	0.14	

Table 4. Yield of Groundnut at harvest as influenced by Irrigation Scheduling and Foliar Organic Nutrition

Treatments	Pod Yield (t/ha)	Haulm Yield (t/ha)	Harvest Index (%)
3 Irrigations (25,45,70 DAS) + panchagavya-3%	2.85	4.40	39.31
3 Irrigations (25,45,70 DAS) + jeevamrutha-3%	2.76	4.28	39.24
3 Irrigations (25,45,70 DAS) + panchamrutha-3%	2.55	4.26	37.42
2 Irrigations (25,45 DAS) + panchagavya-3%	2.36	4.22	35.84
2 Irrigations (25,45 DAS) + jeevamrutha-3%	2.27	4.17	35.21
2 Irrigations (25,45 DAS) + panchamrutha-3%	2.20	4.13	34.74
2 Irrigations (25,70 DAS) + panchagavya-3%	2.19	3.88	36.02
2 Irrigations (25,70 DAS) + jeevamrutha-3%	2.12	3.76	36.08
2 Irrigations (25,70 DAS) + panchamrutha-3%	2.09	3.58	36.84
Control	1.99	3.37	37.11
F test	S	S	S
SEm(±)	0.01	0.01	0.13
CD (p=0.05)	0.04	0.02	0.38

3. RESULTS AND DISCUSSION

3.1 Growth

According to the recorded and tabulated data pertaining to growth parameters, the significantly ($p= 0.05$) higher plant height (60.07 cm) and higher plant dry weight (39.62 g) at harvest was recorded in treatment with application of 3 Irrigations (25,45,70 DAS) + panchagavya-3%.

Increase in plant height with might be due to well availability of soil moisture under irrigation scheduling during the critical stages of crop growth at the root zone of the crop and higher nutrient availability, rapid conversion of carbohydrates into protein which in turn elaborated in to protoplasm. These results are in conformity with observations of Naresha et al. [1] and Madhuri Devi et al. [2] ie., "optimum supply of soil moisture surrounding the root zone which cause favorable improvement in the uptake and translocation of the nutrients and ultimately linked with the plant growth and development in terms of plant height optimum moisture conditions at all the growth stages may have promoted may have promoted the cell division and cell expansion activities and there by stem elongation which virtually increased the plant growth in terms of plant height".

The increased plant height and plant dry weight may be due to continuous supply of nutrients due to the release of nutrients from organics resulted in better translocation of photosynthates and panchagavya includes coconut water (contains kinetin) increased cytokinin content in leaf, which in turn increased chlorophyll content and photosynthetic activity for longer period. These results were in close conformity with findings of Ravi Kumar et al. [3] ie., "in panchagavya spray, the easy transfer of nutrients to plant through foliar spray and the quantities of IAA and GA present in panchagavya could have created the stimuli in the plant system and which in turn increased the production of growth regulators in cell system. Hence, stimulated the necessary growth and development in plants, leading to better yield".

3.2 Yield Attributes

According to the yield characteristics data that was collected and analysed at harvest, maximum number of pods/ plant (20.33), maximum number of kernels/ pod (2.47) and higher seed index (40.08g) was recorded in treatment with the

application of 3 Irrigations (25,45,70 DAS) + panchagavya-3%.

The higher performance of yield attributes might be due to the fact that, availability of sufficient soil moisture at the root zone which in turn supplies all the nutrients to the crop during all the growth stages as a result raised the values of yield attributes. These results are in close conformity with the findings of Solanke et al. [4], Bibhu Santosh Behera et al. [5] ie., "adequate moisture availability combined with higher irrigation frequency resulted in luxurious crop growth and, as a result, raised the values of yield attributes".

3.3 Yield

After evaluated the data recorded post harvesting of crop show that significantly ($p= 0.05$) higher pod yield (2.47 t/ha), higher haulm yield (4.4 t/ha) and harvest index (39.31%) was recorded in treatment with the application of 3 Irrigations (25,45,70 DAS) + panchagavya-3%.

The easy transfer of nutrients to plants via foliar spray, as well as the quantities of IAA and GA present in panchagavya, could have created stimuli in the plant system, increasing the production of growth regulators in the cell system. As a result, the necessary growth and development in plants was stimulated, resulting in higher yield. These results are in close conformity with the findings of Ravi Kumar et al. [3], Vikash et al. [6] ie., Increased yield may be owing to the synergistic impact of the combinational application of panchagavya and jeevamrutha contain all essential micro and macronutrients which is essential for crop growth and yield both of which play important roles in vegetative and reproductive development, and therefore in the production of economic component [7-11].

4. CONCLUSION

On the basis of the aforementioned experimental results, it is determined that application of 3 Irrigations (25,45,70 DAS) + panchagavya-3% accomplished better growth parameters, yield attributes and higher pod yield in groundnut crop .

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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