

Bio-Efficacy of Bio Stimulant Humic Based Granular Fertilizer (ARI DIAMOND) Promoting Growth and Yield of Groundnut (*Arachis hypogaea L.*)

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Abstract: The Field experiment was conducted and study about the “Bio-efficacy of Bio stimulant Humic based granular fertilizer (Ari Diamond) promoting growth and yield of Groundnut crop” at three different Agro climatic location in Tamil Nadu during the *kharif* season (June - October, 2023). The treatments comprise of various levels of bio-stimulant *viz.*, 5, 10, 15, 20 kg ha⁻¹ along with RDF which are applied on Groundnut crop. The experiment was laid out in Randomized Block Design (RBD) with replicated four times with six treatments for each Agro climatic location. The Six treatments were made at each location *i.e.*, T₁ - Control, T₂ - 100% Recommended Dose Fertilizer, T₃ - 100% RDF + Bio stimulant @ 5 kg ha⁻¹, T₄ - 100% RDF + Bio stimulant @ 10 kg ha⁻¹, T₅ - 100% RDF + Bio stimulant @ 15 kg ha⁻¹, T₆ - 100% RDF + Bio stimulant @ 20 kg ha⁻¹. The results concluded that T₆ - 100% RDF + Bio stimulant @ 20 kg ha⁻¹ application recorded the highest growth parameters like plant height, number of branches per plant, Total dry matter production and achieve higher values for yield characters *viz.*, number of pods per plant, pod weight per plant, pod yield and haulm yield over the control.

Index Terms: Groundnut, Bio stimulant Granules, Number of pods per plant, Pod yield, Haulm yield.

INTRODUCTION

Groundnut is the major oilseed crop in India. It is commonly known as peanut, poor man’s almond and also called as king of oil seeds. Groundnut seeds are valued for both its oil and protein content. The groundnut productivity was low due to improper nutrient management practices, low rainfall and low amount of nutrients in the soil. Among many factors, maintenance of organic matter in satisfactory level is one of the constraints. Among organic manures, farm yard manure is one of the major sources of manure in

ancient times. However, limited availability of manures and slow release of plant nutrients from the manures are important constraints in their use as source of nutrients. Recently, use of organic manures reduced due to non-availability in adequate quantities and high-cost factor involved. So, it is necessary to go for Bio stimulants having humic substances and Seaweed extract for better soil condition, higher input use efficiency and enhanced productivity of crops. Schnitzer (2000) reported that the term total humic substances (humic acid + fulvic acid + humin) are also synonymous with soil organic matter. Humic acid application along with recommended dose of fertilizers and organic manures plays a greater role in plant biochemical and physiological activities and soil fertility, consequently resulting in better growth and yield of crops (Kalaichelvi *et al.*, 2006).

Humic acid extracted from various resources such as lignite, peat, coal, farm yard manure, coir pith etc., besides natural persistence in the soil. Alginic acid Seaweed extracted from Brown Algae. Bio stimulants might benefit plant growth by improving nutrient uptake and hormonal effects. Some studies have documented yield increases in vegetables, root crops, flowers and cereals by humic substances (Nikbakht *et al.*, 2008).

MATERIALS AND METHODS

The field experiment was conducted in farmer’s field at three different Agro climatic location in Tamil Nadu during the *kharif* season (June - October, 2023). The First Agro climatic location were identified and experiment was made at Cauvery Delta Zone having the farmer Name of Pichaipillai at Venmonkondan, Udayarpalayam Taluk, Ariyalur District. The Second

Agro climatic location were identified and experiment was made at North Eastern Zone of Tamilnadu having Farmer name Rajadurai at S.K Palayam, Panruti Taluk, Cuddalore District followed that Third Agro climatic Zone were identified and experiment was made at Western Zone having Farmer name Senthilkumar at Kandampalayam, Namakkal District. The treatments comprise of various levels of bio-stimulant viz., 5, 10, 15, 20 kg ha⁻¹ along with RDF which are applied on Groundnut crop. The experiment was laid out in Randomized Block Design (RBD) with replicated four times with six treatments for each Agro climatic location.

Treatment Details:

T₁ - Control

T₂ - 100% Recommended Dose Fertilizer

T₃- 100% RDF + Bio stimulant @ 5 kg ha⁻¹

T₄ - 100% RDF + Bio stimulant @ 10 kg ha⁻¹

T₅- 100% RDF + Bio stimulant @ 15 kg ha⁻¹

T₆- 100% RDF + Bio stimulant @ 20 kg ha⁻¹

The site was selected on the basis of suitability of soil for growing Groundnut The above mentioned six treatments are included in the study. The recommended dose of fertilizers (25: 50: 75 kg N, P and K kg ha⁻¹) and other package of practices for Groundnut were imposed uniformly for all the treatments including control treatments. The Variety used for treatment is G7. Humic acid + Fulvic + Seaweed extract containing Bio stimulants source used in experiment was Ari Diamond and marketed by Ari Farm Tech, Ariyalur.

The observations were taken in randomly selected and tagged five plants in each plot. Crop was harvested at maturity and data were collected. We counted the pods manually for analyzing pods per plant. The plants were sun dried for two days under field condition. Then the pods were separated from plants manually and dried under the sun till they attain satisfactory drying. The average sum of five plant pods were taken for record. Growth parameters like plant height, number of branches and total dry matter production per plant observation taken at harvest stage. The pod yield and haulm yield per plot were recorded. Statistical analysis of data was done as per the methodology suggested by Gomez and Gomez (1984).

RESULT AND DISCUSSION

Significantly higher number of pods per plant, pod weight per plant, pod yield and haulm yield were recorded with soil application of RDF + Bio stimulant granules @ 20 kg ha⁻¹ (T₆) at 45 DAS in Cauvery Delta Zone Agro climatic Condition, North Eastern Zone and Western Zone which was followed by soil application of 100% RDF + Bio stimulants @ 15 kg ha⁻¹ (T₅) at 45 DAS. The data were presented in Table 1.

Humic seaweed extract is made by extracting and refining marine biological seaweed. It is rich in 18 kinds of protein and amino acids that can be directly absorbed and utilized by plants and plant growth regulators that have significant effects on plant physiological processes. The enhancement in pod and haulm yield in these treatments was significantly over control. These results are in agreement with those of Selim *et al.* (2012).

Significantly higher number of pods per plant, pod weight per plant, pod yield and haulm yield were recorded with soil application of 100% RDF + Bio stimulant granules @ 20 kg ha⁻¹ (T₆) at 45 DAS in Cauvery Delta Zone Agroclimatic Condition, North Eastern Zone and Western Zone. Similarly, increase in yield parameters may be attributed to efficient translocation of photosynthates and appropriate nutrient accessibility. RDF alone treated plot recorded considerably reduced output because quickly uptake of nutrients suddenly over fertilizing can be deadly and can stunt the plants growth, cause them to be weak and spindly or increase its susceptibility to disease and insect damage.

Bio stimulants based humic acid is comparatively slower oxidizable in nature might have released the nutrients slowly oxidizable up to seed filling stage thereby enhancing kernel weight on account of better mobilization of nutrients to seeds. Thenmozhi *et al.* (2004) also reported significant effect of humic acid on yield of groundnut. Dandge *et al.* (2016) also reported significant effect of humic acid on yield of soybean. Significantly higher plant height, number of branches per plant and total dry matter production at harvest were recorded in treatment receiving soil application of 100% RDF + Bio stimulant @ 20 kg ha⁻¹ (T₆) at 45 DAS over control (T₁) and data

presented in Table 2. The improvement in growth characteristics of groundnut in response to Bio stimulants application was due to the presence of growth promoting substances like Indole acetic acid (IAA), gibberellins and auxins in its structure which are directly involved in cell respiration, oxidative phosphorylation, photosynthesis, protein synthesis and various enzymatic reactions.

The pre requirement for greater returns in any crop is a greater accumulation of total dry matter and its partitioning into different components of the plant coupled with the maximum translocation of photosynthates to sink. Total dry matter partitioning in individual plant parts may depends on various

environmental factors influencing growth like interception of photo synthetically active radiation, relative humidity, CO₂ concentration and soil moisture availability. Significantly the least total dry matter production was obtained with T₁. The plots which received RDF only through soil application was found slow growth. However, the plots received RDF with Bio stimulants granules was found better. Higher total dry matter in the treatments which received RDF + Bio stimulant soil application might be due to balanced availability of macro and micro nutrients at all stages by preventing their fixation and precipitation, there by improved nutrient use efficiency and better availability of nutrients in soil. This was in line with the findings of Sangeetha and Singaram (2007).

Table 1: Yield parameters of groundnut as soil application of Biostimulant Granules at different levels

	Treatment Details	No. of Pods per plant	Pod weight per plant (g)	Yield (kg ha ⁻¹)	
				Pod yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)
Cuddalore	T ₁ – Control	16.22	14.64	1777	2617
	T ₂ - Recommended Dose of Fertilizer (RDF)	17.40	16.33	2088	2890
	T ₃ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 5 kg ha ⁻¹	18.81	17.11	2339	3106
	T ₄ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 10 kg ha ⁻¹	19.40	18.82	2472	3308
	T ₅ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 15 kg ha ⁻¹	19.98	18.34	2690	3595
	T ₆ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 20 kg ha ⁻¹	21.95	21.50	2842	3844
	S.Em±	0.15	0.13	34.07	64.07
	CD(P=0.05)	0.45	0.39	102.21	192.21
Ariyalur	T ₁ – Control	15.75	14.32	1808	2628
	T ₂ - Recommended Dose of Fertilizer (RDF)	17.10	16.60	2126	2900
	T ₃ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 5 kg ha ⁻¹	18.41	17.60	2360	3110
	T ₄ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 10 kg ha ⁻¹	19.20	18.55	2502	3411
	T ₅ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 15 kg ha ⁻¹	19.86	19.11	2701	3625
	T ₆ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 20 kg ha ⁻¹	22.34	20.08	2860	3862
	S.Em±	0.14	0.11	32.08	60.02
	CD(P=0.05)	0.42	0.33	96.24	180.06
Namakkal	T ₁ – Control	15.72	15.44	1850	2672
	T ₂ - Recommended Dose of Fertilizer (RDF)	16.83	16.80	2077	2970
	T ₃ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 5 kg ha ⁻¹	17.82	17.40	2425	3204
	T ₄ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 10 kg ha ⁻¹	18.90	18.10	2560	3423
	T ₅ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 15 kg ha ⁻¹	19.98	18.95	2728	3630
	T ₆ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 20 kg ha ⁻¹	21.12	20.16	2882	3892
	S.Em±	0.18	0.16	37.03	66.11
	CD(P=0.05)	0.54	0.48	111.09	198.33

Table 2: Growth parameters of groundnut at harvest as by soil application of Biostimulant Granules at different levels

Locations	Treatment Details	Plant Height (cm)	No. of Branches per plant	Dry Matter Production (g per plant)
Cuddalore	T ₁ – Control	13.33	5.87	22.48
	T ₂ - Recommended Dose of Fertilizer (RDF)	16.68	6.84	24.77
	T ₃ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 5 kg ha ⁻¹	17.72	7.26	26.22
	T ₄ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 10 kg ha ⁻¹	18.69	7.53	27.01

	T ₅ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 15 kg ha ⁻¹	20.01	8.07	28.00
	T ₆ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 20 kg ha ⁻¹	21.06	8.57	29.67
	S.Em±	0.21	0.04	0.18
	CD(P=0.05)	0.63	0.12	0.54
Ariyalur	T ₁ – Control	13.01	5.52	23.00
	T ₂ - Recommended Dose of Fertilizer (RDF)	16.43	7.04	25.64
	T ₃ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 5 kg ha ⁻¹	17.70	7.27	26.98
	T ₄ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 10 kg ha ⁻¹	18.44	7.55	28.00
	T ₅ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 15 kg ha ⁻¹	19.24	8.01	28.60
	T ₆ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 20 kg ha ⁻¹	21.10	8.53	29.64
	S.Em±	0.19	0.03	0.16
	CD(P=0.05)	0.57	0.09	0.48
Namakkal	T ₁ – Control	13.47	5.80	23.11
	T ₂ - Recommended Dose of Fertilizer (RDF)	16.21	7.00	24.24
	T ₃ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 5 kg ha ⁻¹	17.38	7.44	26.78
	T ₄ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 10 kg ha ⁻¹	18.90	7.90	27.42
	T ₅ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 15 kg ha ⁻¹	20.22	8.22	28.70
	T ₆ - 100% RDF + Biostimulant Granules (Ari Diamond) @ 20 kg ha ⁻¹	21.09	8.47	29.74
	S.Em±	0.24	0.05	0.20
	CD(P=0.05)	0.72	0.15	0.60

CONCLUSION

Findings of the present investigation revealed that the combined application of RDF + Biostimulant found better as compared to soil application of RDF alone and control. Soil application of RDF + Bio stimulant at 20 kg ha⁻¹ at 45 DAS enhanced the growth and yield parameters of groundnut. It's loosening the soil; good aeration leads to root respiration and the occurrence of higher pod formation and pod yield in groundnut crops. It effectively regulates soil acidification, salinization and compaction hazards and provides a favourable environment for crop growth in the root environment with the dual effects of medicine and fertilizer to inhibit soil borne diseases. We revealed that biostimulants containing organic iodine in seaweed can make insects instinctively evade, prevent and reduce fungal diseases, so it can reduce pests and diseases to a certain extent naturally and to makes crop have antiviral effects. Its leads to increase yield and improve crop quality.

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