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Study of Enhancing Summer Groundnut (*Arachis hypogaea* L.) Yield Attributed Characters through Foliar Nutrition

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A B S T R A C T

Summer groundnut is one of the most important oilseed legume crop grown in India having high yield than its *kharif* season crop. The field study at oilseed research station Jalgaon, revealed recommendation to the farmers of Maharashtra for enhancement of yield of summer groundnut through foliar application of water soluble fertilizers after three year study. The field study was carried for the three consecutive year 2018, 2019, 2020 summer season at Jalgaon location with 11 different treatment in Randomized Block Design. It is found that treatment T11 i.e. application of 75%RDF +2.0 % WSF at 45,60 and 75 DAS(18.75 kg N/ha+ 37.50 kg P_2O_5/ha) is found significantly superior to increase the No. of pod /plant (24.04), dry pod yield (3030Kh/ha), kernel yield (2209.27 kg/ha), haulm yield(5344 kg/ha), net monetary returns(Rs./ha.1,17,765) and B:C ratio (2.96) of summer groundnut over rest of the treatment. While the treatment T 9(75%RDF+2.0 % WSF at 45 and 60 DAS) and treatment T10(75%RDF +1.5 % WSF at 45, 60 and 75 DAS) found at par with it for same as No. of branches/plant (10.26,9.52), No. of pods/plant(21.83,22.79), Dry pod yield kg/ha (2772kg/ha,2653kg/ha), Haulm yield kg/ha (5110,4905) Net monetary returns(Rs/ha)(99,916,102398) with the B:C ratio (2.61,2.71)respectively. So comparatively the recommendation is accepted in Joint Agrosco at VNAU Parbhani in 2021 that with the monetary returns and B:C ratio with haulm yield and dry pod yield the treatment T9(75% RDF +2.0% WSF at 45 and 60 DAS) with saving the cost of cultivation having best performance.

Introduction

Among oilseed crops groundnut is an important crop grown in tropical and sub tropical regions in the world for vegetable oil. The groundnut, often called as "The King of Oilseeds", is botanically known as *Arachis hypopgaea* L. and belongs to family Leguminosae. It is the most versatile legume because of drought tolerant characters, soil restoring properties, weeds smothering, multipurpose confectionary and dilatory uses. As a legume oil yielding crop, it fits well into most of the cropping systems. Commercially, groundnut is the world's fourth most important sources of edible oil and third most important sources of vegetable protein. The groundnut crop is grown over an area of 26.62 million ha spread over 84 countries with an annual production of 35.66 million tonnes pods with a

productivity of 1348 kg ha-1.In India, it is being grown in 11 states in an area of 4.19 million ha with a production of 5.62 million tonnes of pods per annum. The average productivity of groundnut in India (1341 kg ha-1) can be comparable to world average (Anon., 2013). The low groundnut productivity in Maharshtra could be attributed to several production constraints, which include poor and imbalanced nutrition and cultivation in marginal lands. Therefore, it is most essential to pay a great attention to the nutrition of groundnut to enhance its productivity. Foliar feeding practice would be more useful in exhaustive crop like groundnut. Foliar nutrition reduces the amount of fertilizer thereby reducing the loss and also economizing crop production. Crop nutrition through foliar feeding at particular stage may solve the slow growth and low seed yield of legumes without involving root absorption at critical stages. Among the primary macronutrients, nitrogen (N) is a major structural component of the plant cell. It plays an important role in plant metabolism and is involved in synthesis of proteins, amino acids and nucleic acids. Phosphorus (P) is essential for the formation of protoplasm, cell division and development of meristematic tissues, hastens nodule formation. Potassium (K) plays an important role in enzyme formation, turgidity to plants, translocation of assimilates, photosynthates, proteins, starch synthesis besides improving the quality of the produce with the enhancement of resistance against the biotic and abiotic stress around the plant. Foliar nutrition can help to maintain a nutrient balance within the plant, which may not occur strictly with soil uptake (Meena *et al.,* 2007).also triggers a plant response to increased water and nutrient uptake from the soil (Veeramani *et al.,* 2012). The effectiveness of foliar applied nutrients is determined by the type of formulation and the time of application. Foliar spray stimulates and direct use in plant leaf for an increase in chlorophyll production, cellular activity and respiration. It also triggers a plant response to increased water and nutrient uptake from the soil (Veeramani *et al.,* 2012). Hence, it is feasible, economically viable and environment friendly approach of nutrient management and a need was felt to optimize the foliar application of all macro nutrients along with recommended doses of nutrient application through soil for nutritionally hungered soils of groundnut with minimum cost for high returns.

Materials and Methods

The field experiment is conducted under state plan project at Oilseed Research Station, Jalgaon, Maharashtra which is under administrative control of Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahemadnager, (M.S.). This centre was situated in agro-climatic Zone III B of Maharashtra state at latitude and longitude (21.00770N, 75.56260E) with 770 to 800 cm. average rainfall having medium to deep black cotton soil and P^H 6.8-7.5. The summer groundnut (Cultivar- JL 776) was grown in month of III rd week of January during year, 2018, 2019, 2020 for this experiment. The field experiment was laid out in a randomized block design with three replications and eleven treatments with the plot size of as 3.30*2.80 m^2. The recommended dose of fertilizer 50:25:00 kg/ha is applied. All the agricultural statistical above observation is carried out by using (Panse and Sukatme, 1985). Water management done as per necessary climatic condition. Field maintain with clean by hand weeding. All the necessary observation were taken at maturity stage as per the following table.

Results and Discussion

The three summer 2018, 2019 and 2020 year pool mean is cited above (Table 02) with different yield and yield attributing characters. With all above eleven treatment we found in pool mean that numerically final plant stand (000/ha) is grater in treatment T11 (75% RDF +2.0 % WSF at 45,60 and 75 DAS) 323.89 and followed by treatment T9 (75% RDF +2.0 % WSF at 45 and 60 DAS)316.12.

No. of branches /plant is observed significantly superior in treatment T11 (75% RDF +2.0 % WSF at 45,60 and 75 DAS)10.59 and followed by treatment T10 (75% RDF +1.5 % WSF at 45, 60 and

75 DAS) 10.26 and T9 (75% RDF +2.0 % WSF at 45 and 60 DAS)9.52.

No. of pod /plant is observed significantly superior in treatment T11 (75% RDF +2.0 % WSF at 45,60 and 75 DAS) 24.04 and followed by treatment T10 (75% RDF +1.5 % WSF at 45, 60 and 75 DAS)22.79 and T9 (75% RDF +2.0 % WSF at 45 and 60 DAS) 21.83.

Dry pod yield kg/ha is observed significantly superior in treatment T11 (75% RDF +2.0 % WSF at 45,60 and 75 DAS) 3030kg/ha, followed by treatment T10 (75% RDF +1.5 % WSF at 45, 60 and 75 DAS)2 772 kg/ha and T9 (75% RDF +2.0 % WSF at 45 and 60 DAS) 2653 kg/ha.

Haulm yield kg/ha is observed significantly superior in treatment T11 (75% RDF +2.0 % WSF at 45,60 and 75 DAS) 5344kg/ha, followed by treatment T10 (75% RDF +1.5 % WSF at 45, 60 and 75 DAS) 5110 kg/ha and T9(75%RDF +2.0 % WSF at 45 and 60 DAS) 4905 kg/ha.

Kernal yield kg/ha is observed numerically superior in treatment T11 (75% RDF +2.0 % WSF at 45,60 and 75 DAS) 2209.27 kg/ha, followed by treatment T10 (75% RDF +1.5 % WSF at 45, 60 and 75 DAS)1948 kg/ha and T9(75%RDF +2.0 % WSF at 45 and 60 DAS) 1856.63 kg/ha.

In concern with gross monetary returns (Rs./ha) is observed significantly superior in treatment T11 (75% RDF +2.0 % WSF at 45,60 and 75 DAS) Rs.198640/ha, followed by treatment T10(75%RDF +1.5 % WSF at 45, 60 and 75 DAS) Rs.178677/ha and T9 (75% RDF +2.0 % WSF at 45 and 60 DAS) Rs.171229/ha.

In concern with net monetary returns (Rs./ha) is observed significantly superior in treatment T11 (75% RDF +2.0 % WSF at 45,60 and 75 DAS) Rs.117765/ha, followed by treatment T10 (75%RDF +1.5 % WSF at 45, 60 and 75 DAS) Rs.102398/ha and T9 (75% RDF +2.0 % WSF at 45 and 60 DAS) Rs.99916/ha. Benefit –Cost ratio (B:C Ratio): The total cost of cultivation ha-1 was calculated for each treatment on the basis of input cost. Gross returns hectare-1 was computed by considering the prevailing market price of the output. Net returns ha-1 were arrived at by deducting the cost of cultivation of respective treatments from gross returns for the corresponding treatments. Benefit-cost ratio was worked out for each treatment. The B:C ratio found significantly superior in treatment T11(75%RDF +2.0 % WSF at 45,60 and 75 DAS) 2.96, followed by treatment T10(75%RDF +1.5 % WSF at 45, 60 and 75 DAS)2.71 and T9(75%RDF +2.0 % WSF at 45 and 60 DAS) 2.61. The water soluble fertilizers 19:19:19 is the starter grade fertilizer good source of all three forms of nitrogen i.e. amide, ammonical, nitrate which helpful for promotion of root growth and shoot development of the plant. This grade fertilizers at @0.5 in three spray at 30,45,60 DAS showing high B;C ratio in cowpea. (Singhal *et al.*, 2015) Pigeon pea performed better with application of 1.0% foliar spray of 19:19:19 both at peak flowering and pod development stages which has recorded higher benefit (Mallesha, 2013).

The combined spray of water soluble at peculiar growth stage the primary nutrient N, P and K resulted in greater mobilization of macro nutrients as reported by Manasa (2013).

The role of foliar application of nutrients on physiology of crop plants is well established. Therefore, better availability and uptake of nutrients could be assigned as the proper reason behind the significant increase in dry pod yield, haulm yield and kernel yield of the plant.

The similar observations were made by Shivakumar Malladada (2005). The results are in close conformity with the observations recorded by Sarkar *et al.,* (1999) and Sarkar and Pal (2006), who also reported response of groundnut to the applied foliar nutrition. The same finding resemble with Veerabhadrappa and Yeledhalli (2005) and Veeramani *et al.,* (2012); Chandrasekaran *et al.,* (2008); Pierre *et al.,* (2019).

Table.1 Treatment detail as below

Tr. No.	Treatment details
T_1	Control (Fertilizer as per RDF)
T_2	75% RDF as soil application
T_3	50% RDF as soil application
T_4	50% RDF +1.5 % WSF at 45 and 60 DAS
T_5	50% RDF +2.0 % WSF at 45 and 60 DAS
T_6	50% RDF +1.5 % WSF at 45, 60 and 75 DAS
T_7	50% RDF +2.0 % WSF at 45 ,60 and 75 DAS
T_8	75% RDF +1.5 % WSF at 45 and 60 DAS
T_9	75% RDF +2.0 % WSF at 45 and 60 DAS
T_{10}	75% RDF +1.5 % WSF at 45, 60 and 75 DAS
T_{11}	75% RDF +2.0 % WSF at 45 ,60 and 75 DAS

Table.2 Summer groundnut with different observation mean of year 2018, 2019, 2020

Sr.No.	Treatment Details	Final plant Stand 000/ha	No. of branches /plant	No. of pod/ plant	Dry pod yield Kg/ha	Haulm yield kg/ha	Kernel yield kg/ha	Gross monetary return Pooled mean (Rs/ha)	Cost of cultivation Rs/ha	Net monetary return Rs/ha	B:C ratio
T_1	Control (Fertilizer as per RDF)	307.47	7.63	20.00	2205	3642	1537.07	142273	59677	69444	2.16
T_2	75% RDF as soil application	307.13	6.90	16.67	2015	3671	1399.57	13195	58867	59534	2.01
T_3	50% RDF as soil application	308.24	6.47	13.16	1846	3564	1301.57	119485	58056	50445	1.87
T_4	50% RDF +1.5 % WSF at 45 and 60 DAS	309.17	6.80	16.27	2233	3877	1498.83	143863	58756	71934	2.22
T_5	50% RDF +2.0 % WSF at 45 and 60 DAS	310.67	6.95	16.64	2316	4029	1550.27	149544	58790	76955	2.31
T_6	50% RDF +1.5 % WSF at 45, 60 and 75 DAS	312.14	7.30	17.22	2354	4343	1585.20	152091	59090	79035	2.34
T_7	50% RDF +2.0 % WSF at 45 ,60 and 75 DAS	312.75	7.51	18.00	2336	4382	1650.27	150294	59123	77627	2.31
T_8	75% RDF +1.5 % WSF at 45 and 60 DAS	313.54	7.99	18.60	2418	4342	1702.80	155103	59567	81653	2.37
T_9	75% RDF +2.0 % WSF at 45 and 60 DAS	316.12	9.52	21.83	2653	4905	1856.63	171229	59600	99916	2.61
T_{10}	75% RDF +1.5 % WSF at 45, 60 and 75 DAS	315.62	10.26	22.79	2772	5110	1948.77	178677	59967	102398	2.71
T_{11}	75% RDF +2.0 % WSF at 45, 60 and 75 DAS	323.89	10.59	24.04	3030	5344	2209.27	198640	60000	117765	2.96
	S.Em ±	8.90	0.39	1.57	162	267	119	10874	---	9695	0.16
	C.D. at 5%	NS	1.15	4.63	479	787	NS	32077	---	28602	0.48

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