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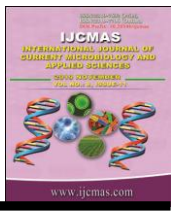

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Effect of Nutrients Management Modules for Minimizing Drought Impact and Groundnut Yield Maximization in Rainfed Conditions

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A B S T R A C T

A field experiment was conducted at Dry Farming Research Station, Junagadh Agricultural University, Targhadia (Gujarat) during *kharif* seasons of 2013 to 2016 to ascertain the effect of nutrients management modules for minimizing drought impact and groundnut yield maximization in rainfed conditions. The experiment was laid out in randomized block design with ten different treatments *viz.*, T_1-Absolute control, T_2-Water spray-no nutrients, T_3-Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) at 30 to 35 DAS, T_4-Foliar spray of Fe & Zn micronutrients @ 1 % at 30 to 35 DAS, T_5-Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) and Fe & Zn micronutrients @ 1 % at 30 to 35 DAS, T_6-Foliar spray of selenium @ 20 g/ha at 30 to 35 DAS T_7-Foliar spray of 2 % Urea at 30 to 35 DAS T_8-Foliar spray of KNO_3 2 % at 30 to 35 DAS T_9 Foliar spray of KNO_3 2 % at 60 DAS T_{10} Foliar spray of 2 % Urea at 30 to 35 DAS + KNO_3 2 % at 60 DAS were evaluated in randomized block design with three replications. The farmers of North Saurashtra Agro-climatic Zone growing groundnut GG-20 are advised to make foliar spray of 2% urea at 30 to 35 DAS for obtaining higher productivity and maximum net returns and improving water use efficiency under dry farming conditions.

Introduction

Groundnut is one of the most popular and universal crop cultivated in more than 120 countries. In India, it is cultivated on area of 5.53 M ha with production of 9.67 M tones and productivity of 1750 kg ha^{-1}during 2013-2014 (AICRPG, 2015). Based on rainfall pattern, soil factors, diseases and pest situations, groundnut growing area in India has been divided into five zones. Currently six states *viz.*, Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra and Rajasthan account for more than 90% of the

total groundnut area and 89.3% of total groundnut production. Madhya Pradesh, Uttar Pradesh, Odisha and West Bengal are the other states having substantial area under this crop. Among the major groundnut growing states, Gujarat rank first in area (1.84 M ha) and production (4.92 M tones) with productivity of 2670 kg ha^{-1} (AICRPG, 2015). Nutrient management module plays an important role in boosting groundnut production. Among the various agronomic practices, nutrient management has an important role in maximizing the pod yield. Nutrients affected all most growth and yield attributing characters and yields through its doses as well as sources. Groundnut is an important oilseed crop of dry farming region in the tropics and subtropics.

The groundnut crop suffers from moisture and nutrients stress during dry spells and need to supplement during this period. The balanced supply of nutrients enables the crop to cope up dry spells. Hence, the trial is formulated to test the effect of different chemical on crop yield. Considering the facts and views highlighted above, the present study was undertaken to assess the Effect of nutrients management modules for minimizing drought impact and groundnut yield maximization in rain fed regions.

Materials and Methods

A field experiment entitled "Effect of nutrients management modules for minimizing drought impact and groundnut yield maximization in rain fed regions**.**'' was carried out at Dry Farming Research Station, Junagadh Agricultural University, Targhadia (Gujarat) during *kharif* seasons of 2013 to 2016.

The experiment comprising ten treatments of nutrient management *viz*., T_1-Absolute control, T_2-Water spray-no nutrients, T_3-Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) at 30 to 35 DAS, T_4-Foliar spray of Fe and Zn micronutrients @ 1 % at 30 to 35 DAS, T_5-Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) and Fe & Zn micronutrients @ 1 % at 30 to 35 DAS, T_6-Foliar spray of selenium @ 20 g/ha at 30 to 35 DAS T_7-Foliar spray of 2 % Urea at 30 to 35 DAS T_8-Foliar spray of KNO_3 2 % at 30 to 35 DAS T_9 Foliar spray of KNO_3 2 % at 60 DAS and T_{10} Foliar spray of 2 % Urea at 30 to 35 DAS + KNO_3 2 % at 60 DAS were evaluated in randomized block design with three replications.

The soil of the experimental plot was medium black, pH 8.0 and organic carbon 0.67%. The soil was low in available phosphorus (10.20 kg ha^{-1}), potash (327 kg ha^{-1}) and medium in zinc and iron. Groundnut cv. GG 20 was sown at 60cm spacing with 100 kg seed ha^{-1} in first week of July.

The recommended dose of fertilizers @ 12.5:25.0:00 kg NPK/ha. Other cultural operations were done as per recommendation and crop requirements. Regularly biometric observations were recorded at specific time intervals by selecting randomly five plants in each treatment. Finally the crop was harvested and produce were dried, threshed, cleaned and weighed.

Results and Discussion

Growth parameters

The pooled result given in table 1 revealed that effect of nutrient management treatments on plant height, number of branches, number of pods as well as number of nodules per plant were remain non-significant.

These findings are in close conformity with those reported by Salve *et al.*, (2010), Deshmukh *et al.*, (2012), Patil *et al.*, (2014), Bhosale and Pisal (2017).

Yield

Pod yield of groundnut

The result given in table 2 indicated that effect of nutrient management on pod yield of groundnut were found significant during year 2014-15, 2015-16 and 2016-17 and non-significant 2013-14 and in pooled results. The data also revealed that higher pod yield (1655 kg/ha) was recorded under T_7 (Foliar spray of 2% urea at 30 to 35 DAS) in pooled results of four successive years. Whereas, lower pod yield (1206 kg/ha) was recorded under T_1 (absolute control). The findings are close with findings of Thorave and Dhonde (2008), Sharma*et al.*, (2011), Deshmukh *et al.*, (2012), Bhosale and Pisal (2017).

Table.1 Biometric observation as affected by different treatments (Mean)

Tr. No.	Treatments	Plant height (cm)	No. of branches/pl.	No of pod/ plant	No of nodules/ plant
T_1	Absolute control	28	6	8	21
T_2	Water spray-no nutrients	26	6	8	20
T_3	FS of water soluble fertilizer @ 1 % (NPK-19-19-19) at 30 to 35 DAS	27	6	8	18
T_4	Foliar spray of Fe & Zn micronutrients @ 1 % at 30 to 35 DAS	28	6	8	18
T_5	Foliar spray of water soluble fertilizer NPK-19-19-19 @ 1 % and Fe & Zn micronutrients @ 1 % at 30 to 35 DAS	27	6	8	21
T_6	FS of selenium @ 20 g/ha at 30 to 35 DAS	27	6	8	19
T_7	Foliar spray of Urea @ 2 % at 30 to 35 DAS	29	6	11	22
T_8	Foliar spray of KNO_3 @ 2 % at 30 to 35 DAS	28	6	9	21
T_9	Foliar spray of KNO_3 @ 2 % at 60 DAS	28	5	8	22
T_{10}	FS of Urea @ 2 % at 30-35 DAS + KNO_3 @ 2 % at 60 DAS	29	6	8	18
	S. Em.±	0.66	0.22	0.78	1.48
	C.D. at 5 %	NS	NS	NS	NS
	C.V. %	8.3	12.9	20.1	19.9

Table.2 Pod yield of groundnut (kg/ha) as affected by different treatments

Tr. No.	Treatments	2013-14	2015-16	2016-17	POOLED
T_1	Absolute control	1222	1285	1111	1206
T_2	Water spray-no nutrients	1302	1337	1327	1322
T_3	Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) at 30 to 35 DAS	1417	1424	1389	1410
T_4	Foliar spray of Fe & Zn micronutrients @ 1 % at 30 to 35 DAS	1444	1444	1235	1374
T_5	Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) and Fe & Zn micronutrients @ 1 % at 30 to 35 DAS	1528	1438	1420	1462
T_6	FS of selenium @ 20 g/ha at 30 to 35 DAS	1472	1510	1204	1395
T_7	Foliar spray of 2 % Urea at 30 to 35 DAS	1556	1528	1883	1655
T_8	Foliar spray of KNO_3 2 % at 30 to 35 DAS	1361	1563	1481	1468
T_9	Foliar spray of KNO_3 2 % at 60 DAS	1611	1493	1821	1642
T_{10}	Foliar spray of 2 % Urea at 30 to 35 DAS + KNO_3 2 % at 60 DAS	1556	1667	1605	1609
	S. Em.±	119.0	68.2	255.3	96.62
	C.D. at 5 %	NS	202.7	NS	274.11
	C.V. %	14.2	8.1	30.6	19.93

Table.3 Haulm yield (kg/ha) of groundnut as affected by different treatments

Tr. No.	Treatments	2013-14	2015-16	2016-17	POOLED
T_1	Absolute control	3833	3622	4917	3725
T_2	Water spray-no nutrients	3861	3656	4917	3640
T_3	Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) at 30 to 35 DAS	4111	4022	4417	3754
T_4	Foliar spray of Fe & Zn micronutrients @ 1 % at 30 to 35 DAS	3458	4244	4028	3601
T_5	Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) and Fe & Zn micronutrients @ 1 % at 30 to 35 DAS	3653	3800	4806	3638
T_6	FS of selenium @ 20 g/ha at 30 to 35 DAS	4153	3911	4861	2499
T_7	Foliar spray of 2 % Urea at 30 to 35 DAS	4569	4000	5833	4180
T_8	Foliar spray of KNO_3 2 % at 30- 35 DAS	3778	4089	5528	3901
T_9	Foliar spray of KNO_3 2 % at 60 DAS	4056	4200	4861	3890
T_{10}	Foliar spray of 2 % Urea at 30 to 35 DAS + KNO_3 2 % at 60 DAS	4306	4506	4222	3891
	S. Em.±	162.1	168.2	376.7	184.19
	C.D. at 5 %	481.6	499.7	NS	NS
	C.V. %	7.1	7.3	13.5	10.67

Table.4 Economics of different treatments

Tr. No.	Yield (kg/ha)		Cost of cultivation (Rs/ha)	Gross return (Rs./ha)	Net return (Rs/ha)	B:C ratio	RWUE (kg/ha-mm)
	Pod	Haulm					
T_1	1206	3725	25723	72895	47172	1.83	2.12
T_2	1322	3640	25923	77690	51767	2.00	2.32
T_3	1410	3754	26673	82220	55547	2.08	2.48
T_4	1374	3601	26223	79835	53612	2.04	2.41
T_5	1462	3638	26973	83980	57007	2.11	2.57
T_6	1395	2499	26723	75270	48547	1.82	2.45
T_7	1655	4180	25986	95375	69389	2.67	2.91
T_8	1468	3901	27723	85565	57842	2.09	2.58
T_9	1642	3890	27723	93340	65617	2.37	2.89
T_{10}	1609	3891	28223	91860	63637	2.25	2.83

Haulm yield of groundnut

The result given in table 3 revealed that effect of nutrient management on haulm yield of groundnut were found significant during year 2013-14, 2015-16, 2016-17 and were remained non-significant in year 2014-15and in pooled results. The data also revealed that highest haulm yield (4180 kg/ha) was recorded under T_7 (Foliar spray of 2% urea at 30 to 35 DAS) and the lowest haulm yield (3601 kg/ha) was recorded under T_4 (Foliar spray of Fe and Zn Micronutrients @1% at 30-35 DAS) in pooled results of four successive years. These findings agreement with the results obtained by Thorave and Dhonde (2008)**,** Sharma *et al.*, (2011), Deshmukh *et al.*, (2012), Bhosale and Pisal (2017).

Economics

Economics response of nutrient management treatments on groundnut crop were worked out on the basis of pooled results which presented in Table 4. The data indicated that Treatment T_7 (Foliar spray of 2% Urea at 30 to 35 DAS) gives highest gross returns (Rs.95375 Rs/ha) and net monitory return (Rs.69389 Rs/ha) with B: C ratio of 2.91. Sharma *et al.*, (2013) and Vaghasia and Bhalu (2016). Based on field experimentation, it can be concluded that the farmers of North Saurashtra Agro-climatic Zone growing groundnut GG-20 are advised to make foliar spray of 2% urea at 30 to 35 DAS for obtaining higher productivity and maximum net returns and improving water use efficiency under dry farming conditions.

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