Original Research Article

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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., T1-Absolute control, T2-Water spray-no nutrients, T3-Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) at 30 to 35 DAS, T4-Foliar spray of Fe & Zn micronutrients @ 1 % at 30 to 35 DAS, T5-Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) and Fe & Zn micronutrients @ 1 % at 30 to 35 DAS, T6-Foliar spray of selenium @ 20 g/ha at 30 to 35 DAS T7-Foliar spray of 2 % Urea at 30 to 35 DAS T8-Foliar spray of KNO3 2 % at 30 to 35 DAS T9-Foliar spray of KNO3 2 % at 60 DAS T10 Foliar spray of 2 % Urea at 30 to 35 DAS + KNO3 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.

Keywords: Groundnut, Nutrients, Management, Modules, Yield, Water use efficiency

Article Info

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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 (AICRPBG, 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 \textit{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 T7-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 \textit{et al.}, (2010), Deshmukh \textit{et al.}, (2012), Patil \textit{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 T7 (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 T1 (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 |
|---------|----------------------------------------------------------------------------|-------------------|---------------------|-----------------|---------------------|
| T1      | Absolute control                                                          | 28                | 6                   | 8               | 21                  |
| T2      | Water spray-no nutrients                                                  | 26                | 6                   | 8               | 20                  |
| T3      | FS of water soluble fertilizer @ 1 % (NPK-19-19-19) at 30 to 35 DAS       | 27                | 6                   | 8               | 18                  |
| T4      | Foliar spray of Fe & Zn micronutrients @ 1 % at 30 to 35 DAS              | 28                | 6                   | 8               | 18                  |
| T5      | 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                  |
| T6      | FS of selenium @ 20 g/ha at 30 to 35 DAS                                  | 27                | 6                   | 8               | 19                  |
| T7      | Foliar spray of Urea @ 2 % at 30 to 35 DAS                                 | 29                | 6                   | 11              | 22                  |
| T8      | Foliar spray of KNO₃ @ 2 % at 30 to 35 DAS                                 | 28                | 6                   | 9               | 21                  |
| T9      | Foliar spray of KNO₃ @ 2 % at 60 DAS                                      | 28                | 5                   | 8               | 22                  |
| T10     | FS of Urea @ 2 % at 30-35 DAS + KNO₃ @ 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 |
|---------|----------------------------------------------------------------------------|---------|---------|---------|--------|
| T₁      | Absolute control                                                          | 1222    | 1285    | 1111    | 1206   |
| T₂      | Water spray-no nutrients                                                  | 1302    | 1337    | 1327    | 1322   |
| T₃      | Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) at 30 to 35 DAS | 1417    | 1424    | 1389    | 1410   |
| T₄      | Foliar spray of Fe & Zn micronutrients @ 1 % at 30 to 35 DAS               | 1444    | 1444    | 1235    | 1374   |
| T₅      | 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   |
| T₆      | FS of selenium @ 20 g/ha at 30 to 35 DAS                                   | 1472    | 1510    | 1204    | 1395   |
| T₇      | Foliar spray of 2 % Urea at 30 to 35 DAS                                   | 1556    | 1528    | 1883    | 1655   |
| T₈      | Foliar spray of KNO₃ 2 % at 30 to 35 DAS                                   | 1361    | 1563    | 1481    | 1468   |
| T₉      | Foliar spray of KNO₃ 2 % at 60 DAS                                        | 1611    | 1493    | 1821    | 1642   |
| T₁₀     | Foliar spray of 2 % Urea at 30 to 35 DAS + KNO₃ 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 |
|---------|--------------------------------------------------------------------------------------------|---------|---------|---------|--------|
| T₁      | Absolute control                                                                           | 3833    | 3622    | 4917    | 3725   |
| T₂      | Water spray-no nutrients                                                                   | 3861    | 3656    | 4917    | 3640   |
| T₃      | Foliar spray of water soluble fertilizer @ 1 % (NPK-19-19-19) at 30 to 35 DAS              | 4111    | 4022    | 4417    | 3754   |
| T₄      | Foliar spray of Fe & Zn micronutrients @ 1 % at 30 to 35 DAS                               | 3458    | 4244    | 4028    | 3601   |
| T₅      | 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   |
| T₆      | FS of selenium @ 20 g/ha at 30 to 35 DAS                                                   | 4153    | 3911    | 4861    | 2499   |
| T₇      | Foliar spray of 2 % Urea at 30 to 35 DAS                                                   | 4569    | 4000    | 5833    | 4180   |
| T₈      | Foliar spray of KNO₃ 2 % at 30-35 DAS                                                      | 3778    | 4089    | 5528    | 3901   |
| T₉      | Foliar spray of KNO₃ 2 % at 60 DAS                                                        | 4056    | 4200    | 4861    | 3890   |
| T₁₀     | Foliar spray of 2 % Urea at 30 to 35 DAS + KNO₃ 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

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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                       |                       |                   |           |                 |
| T1      | 1206          | 3725                        | 25723                 | 72895             | 1.83      | 2.12            |
| T2      | 1322          | 3640                        | 25923                 | 77690             | 2.00      | 2.32            |
| T3      | 1410          | 3754                        | 26673                 | 82220             | 2.08      | 2.48            |
| T4      | 1374          | 3601                        | 26223                 | 79835             | 2.04      | 2.41            |
| T5      | 1462          | 3638                        | 26973                 | 83980             | 2.11      | 2.57            |
| T6      | 1395          | 2499                        | 26723                 | 75270             | 1.82      | 2.45            |
| T7      | 1655          | 4180                        | 25986                 | 95375             | 2.67      | 2.91            |
| T8      | 1468          | 3901                        | 27723                 | 85565             | 2.09      | 2.58            |
| T9      | 1642          | 3890                        | 27723                 | 93340             | 2.37      | 2.89            |
| T10     | 1609          | 3891                        | 28223                 | 91860             | 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 2014-15 and in pooled results. The data also revealed that highest haulm yield (4180 kg/ha) was recorded under T7 (Foliar spray of 2% urea at 30 to 35 DAS) and the lowest haulm yield (3601 kg/ha) was recorded under T4 (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 T7 (Foliar spray of 2% Urea at 30 to 35 DAS) gives highest gross returns (Rs.95375 Rs/ha) and net monetary 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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