

Original Research Article

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Economics and Yield of Niger (*Guizotia abyssinica*) as Influenced by Integrated Use of Organic Nutrients for Nitrogen Management

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ABSTRACT

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The present study attempts to scrutinize the options available for supplementing the nitrogen requirement of niger crop through inorganic sources. The study was conducted consecutively for three years at Zonal Agricultural Research Station, Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Chhindwara Madhya Pradesh. The findings of the study reveal that, in niger crop with different Integrated use of organic and inorganic nutrients for nitrogen management application of 75% of RDN through fertilizers + 9% N through FYM +8 N through vermicompost +8% N through oilcake for obtaining sustainable higher yield. Also, Maximum Net return of 1,85,059 ₹/ha was recorded with integrated use of inorganic and organic sources of nutrition.

Introduction

Niger (*Guizotia abyssinica*) is a minor oilseed crop that is grown predominantly under rainfed conditions. Niger seed is used as a human food. The seed contains 37- 47% oil, which is pale yellow with nutty taste and a pleasant odour. The oil is used for culinary purposes, anointing the body, manufacturing paints, soft soaps, for lighting and lubrication.

Today the agriculture production system is becoming an intensive obligatory to sustain population needs.

This necessitates the use of large quantities of expensive fertilizers to replenish the soil nutrients reserves for better and enhanced production. But the resultant nutrient imbalance of several essential elements may lead to antagonistic effect and deficiencies,

which reduces crop yields. The need of the hour is to develop more nutrient dense staple food crop that could help reduce not only pollution but also nutrient malnutrition. There is increasing demand for organically grown niger crop throughout the world Kumar *et al.*, 2019. Organic fertilizers influences both yield and plant micro nutrient content and thus help sustain crop productivity. Organic manuring through locally available source is gaining importance in crop production but the total nutrient requirement of the crop cannot met by only one class of organic sources as the crop demand for various nutrients is much higher. Therefore, there is need to evaluate the utilization of different organic sources in a rational way with inorganic source of nutrients to achieve higher production of niger crop. Keeping in view the above facts the present experiment was conducted.

Materials and Methods

Experiment was conducted under rainfed conditions at Zonal Agricultural Research Station, Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Chhindwara Madhya Pradesh. The study was conducted during *Kharif* season of 2017, 2018 & 2019 consecutively at a fixed. The experimental site is situated at a height of 682m above mean sea level with a latitude range of 21°28' N and longitude range of 78°10' E. It receives an average rainfall of 1084 mm during the crop period the rains were normal. The soil was sandy clay loam with pH 7.9 and EC 0.20 ds/m. The soil contained 189 kg available nitrogen, 20.2 kg available P₂O₅ and 282 kg available K₂O per hectare with 0.46% organic carbon. The experiment was laid out in randomized block design keeping ten treatments. The treatments included T₁: Control, T₂: 75% of RDN + 25% N through FYM, T₃: 75% of RDN + 25% N through vermicompost, T₄: 75% of RDN + 25% N through oil cake, T₅: 75% of RDN + 12^{1/2}% N through FYM +12^{1/2}% N through

vermicompost, T₇: 75% of RDN + 12^{1/2}% N through FYM +12^{1/2}% N through oilcake, T₈: 75% of RDN + 9% N through FYM +8 N through vermicompost +8% N through oilcake, T₉: 75% of RDN, T₁₀: 100% of RDN where RDF is 40 kg N + 20 kg P₂O₅ + 100 kg K₂O per hectare. The crop was raised as per the recommended agronomic practices except for the fertilization that was done as per the treatments. The treatments were allocated in plots of size 11m × 6 m and replicated four times in randomized block design. Application of organic manures and crop residues was made before sowing of crop as per required treatment. The application rates of manures and crop residues were decided to supply same quantities of nitrogen on hectare basis.

Out of recommended fertilizer dosages of fertilizers, half nitrogen and full dose of phosphorous and potassium in the form of urea, single super phosphate and muriate of potash respectively were applied at the time of sowing. Remaining nitrogen was top dressed in two equal splits. The growth and yield attributes viz. Plant height (cm), Number of branches plant⁻¹, Number of capitula plant⁻¹, Number of seeds capitula⁻¹, Number of days taken to 50% flowering, Number of days taken to maturity and 1000 grain weight (g) were measured from five randomly selected tagged plants in each plot. The net plot area was harvested manually at the maturity and the seed yield (kg/ha) were recorded. Prevailing market prices were used for computing net income (₹/ha) and B : C ratio.

Results and Discussion

Summary statistics for the growth attributes, yield attributes and yield have clearly indicated the superiority of the application of 100% of recommended dose of nitrogen through inorganic source. But keeping in view

the objective of study to assess the effect of organic nutrients for nitrogen management and integrated combination of organic and inorganic sources of nitrogen on yield and economics of niger the results are further discussed

Growth attributes

The results of above study showed that crop when supplied with both the organic and inorganic nutrients in a balanced manner (75% of RDN through fertilizers + 9% N through FYM +8 N through vermicompost +8% N through oilcake), all the parameters were highest. Further study of the Table-1 brings to light that growth parameters, viz. plant height (cm), number of branches plant⁻¹, number of days taken to 50% flowering, number of days taken to maturity, were markedly enhanced along the crop growth period as when the crop nitrogen demand was supplied with inorganic and organic sources crop responded more for all growth parameters in comparison to other treatments. These results are in accordance with the findings of Mahajan and Kumar, 2018.

Yield attributing characters and yield

The entire yield attributing characters viz. number of capitula/ plant, number of seeds/capitula and 1000 seeds weight (g) were recorded highest with application of inorganic and organic sources of nitrogen i.e. 75% of RDN through fertilizers + 9% N through FYM +8 N through vermicompost +8% N through oilcake (Table 1). It is palpable from the observations recorded from experiment that crop when supplied with nitrogen through both organic and inorganic mode resulted in better yield attributes whose final outcome was better yield. These results are in line with those reported by Tiwari and Mahajan, 2013.

The seed yield among treatments varied from 501 to 929 kg/ha, respectively (Table 2). The maximum seed yield was recorded with the application of 100% of recommended dose of nitrogen through inorganic source i.e. T₁₀ (100% of RDN through fertilizers). Among the integrated application of organic and inorganic nitrogen sources, application of nitrogen through fertilizer, FYM, vermicompost and oilcake has resulted in higher yield and it was significantly superior to lowest yielding treatment. Higher yield was due to combined application of organic and inorganic nutrients owing to higher growth parameters and most of the yield attributes. Mahajan, 2017 reported that in cereals prolong availability of nutrients through organic and inorganic modes of different crop stages as at basal, active tillering, panicle initiation and flowering stage, respectively reduced sterility percentage and increased yield and yield components.

Economics

For a farmer to adopt any practice economics is the ultimate deciding factor. Net monetary return (₹/ha) under different treatments varied from 9710 to 1, 85,059. Maximum Net return of 1, 85,059 ₹/ha was recorded with application of inorganic and organic sources of nutrients i.e. (75% of RDN through fertilizers + 9% N through FYM +8 N through vermicompost +8% N through oilcake (T₈) (Table 2). The treatment T₁₀ gave B:C of 2.95. But among the integrated use of organic nutrients for nitrogen management packages, B:C ratio was captured highest (2.42) with application of (75% of RDN through fertilizers + 9% N through FYM +8 N through vermicompost +8% N through oilcake. The higher returns with higher inorganic fertilizer application were mainly due to higher seed yield. The results were in line with those obtained by Malviya *et al.*, 2019.

Table.1 Effect of different organic and inorganic modes of nutrients on the growth and yield attributes of Niger (*Guizotia abyssinica*) (Mean of three years)

| Treatments | Plant height (cm) | Number of branches plant ⁻¹ | Number of days taken to 50% flowering | Number of days taken to maturity | Number of capitula/plant | Number of seeds/capitula | 1000 seeds weight (g) |
|---|-------------------|--|---------------------------------------|----------------------------------|--------------------------|--------------------------|-----------------------|
| T₁: Control | 67 | 3 | 55 | 88 | 18 | 21.3 | 3.4 |
| T₂: 75% of RDN* + 25% N through FYM | 85 | 4 | 57 | 89 | 23 | 23.8 | 3.6 |
| T₃: 75% of RDN + 25% N through vermicompost | 88 | 5 | 57 | 90 | 23 | 24.4 | 3.7 |
| T₄: 75% of RDN + 25% N through oil cake | 71 | 4 | 50 | 81 | 17 | 22.7 | 3.2 |
| T₅: 75% of RDN + 12 1/2% N through FYM +12 1/2% N through vermicompost | 70 | 4 | 55 | 90 | 21 | 24.0 | 3.8 |
| T₆: 75% of RDN + 12 1/2% N through FYM +12 1/2% N through oilcake | 79 | 5 | 55 | 90 | 25 | 22.3 | 3.6 |
| T₇: 75% of RDN + 12 1/2% N through vermicompost +12 1/2% N through oilcake | 90 | 4 | 54 | 94 | 21 | 23.7 | 3.6 |
| T₈: 75% of RDN + 9% N through FYM +8 N through vermicompost +8% N through oilcake | 85 | 5 | 55 | 95 | 24 | 24.7 | 3.7 |
| T₉: 75% of RDN, | 82 | 4 | 56 | 88 | 21 | 22.0 | 3.6 |
| T₁₀: 100% of RDN | 83 | 4 | 56 | 92 | 22 | 24.0 | 3.7 |
| CD (P=0.05) | 5.24 | NS | NS | NS | 3.45 | 12.4 | NS |

*RDF is 40 kg N + 20 kg P₂O₅ + 100 kg K₂O per hectare

Table.2 Effect of different organic and inorganic modes of nutrients on the yield and economics of Niger (*Guizotia abyssinica*) (Mean of three years)

| Treatment | Seed yield (kg/ha) | Cost of cultivation (₹ /ha) | Gross monetary return (₹ /ha) | Net monetary return (₹ /ha) | B:C ratio |
|---|--------------------|-----------------------------|-------------------------------|-----------------------------|-----------|
| T₁: Control | 501 | 5517 | 15227 | 9710 | 1.76 |
| T₂: 75% of RDN* + 25% N through FYM | 799 | 8943 | 25666 | 16723 | 1.87 |
| T₃: 75% of RDN + 25% N through vermicompost | 753 | 8055 | 25614 | 17559 | 2.18 |
| T₄: 75% of RDN + 25% N through oil cake | 798 | 8953 | 28201 | 19248 | 2.15 |
| T₅: 75% of RDN + 12 1/2% N through FYM +12 1/2% N through vermicompost | 772 | 8697 | 27918 | 19221 | 2.21 |
| T₆: 75% of RDN + 12 1/2% N through FYM +12 1/2% N through oilcake | 783 | 8766 | 27612 | 18846 | 2.15 |
| T₇: 75% of RDN + 12 1/2% N through vermicompost +12 1/2% N through oilcake | 793 | 8748 | 28344 | 19596 | 2.24 |
| T₈: 75% of RDN + 9% N through FYM +8 N through vermicompost +8% N through oilcake | 815 | 8837 | 30222 | 21385 | 2.42 |
| T₉: 75% of RDN, | 710 | 80812 | 265871 | 185059 | 2.29 |
| T₁₀: 100% of RDN | 929 | 9311 | 36779 | 27468 | 2.95 |
| CD (P=0.05) | 66.54 | - | - | - | - |

*RDF is 40 kg N + 20 kg P₂O₅ + 100 kg K₂O per hectare

From the result of three years experimentation on niger with different Integrated use of organic and inorganic nutrients for nitrogen management, it may be concluded that niger be grown with application of 75% of RDN through fertilizers + 9% N through FYM +8 N through vermicompost +8% N through oilcake for obtaining sustainable higher yield.

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