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Effect of integrated nutrient management on economics of niger (*Guizotia abyssinica* L.)

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Abstract
Agronomical an investigation was carried out held during the kharif season of 2021-22, at the Agronomy Experimental Farm Department, Agriculture college, Latur. To investigate the impact of integrated nutrient management on niger development and yield. The experiment was designed using Randomized Block Design (RBD). The nine therapies were tested three times. The treatments were T_1: Control, T_2: 50% RDF + Azotobacter + PSB, T_3: 75% RDF + Azotobacter + PSB, T_4: 50% RDF + Vermicompost + PSB, T_5: 75% RDF + Vermicompost + PSB, T_6: 50% RDF + Vermicompost + Azotobacter + PSB, T_7: 75% RDF + Vermicompost + Azotobacter + PSB, T_8: 50% RDF + Neem seed cake + Azotobacter + PSB, T_9: 75% RDF + Neem seed cake + Azotobacter + PSB. Each experimental unit's gross (total) and net plot sizes were 5.4 meter × 4.5 meter and 4.5 meter x 3.9 meter, respectively. On July 17, 2021, sowing was carried out using the dibbling method and a seed rate of 5 kg/ha. For the niger crop, the recommended fertilizer dose (RDF) was 40: 20: 00: kg NPK ha^{-1}. The result of the experiment revealed that 75% RDF + Vermicompost + Azotobacter + PSB recorded significantly highest seed yield.

Keywords: Integrated nutrient management, economics, niger, *Guizotia abyssinica* L.

Introduction
Nine oilseed crops can be grown in India under a variety of agro-ecological circumstances, including two non-edible oilseeds (castor and linseed) and seven edible oilseeds (groundnut, rapeseed, mustard, soybean, sunflower, sesame, and safflower). Niger, a member of the asteraceae/compositae family and a significant oilseed crop in India, is called *Guizotia abyssinica* L. Even though it is regarded as a small oilseed crop on a worldwide and national scale, it is crucial in rainfed environments, on hill slopes, and in soils with a coarse texture, particularly on steep slopes and in shallow soils of marginal lands.

In Ethiopia, Nigerian seed is a significant oilseed crop, making up roughly 50% of the nation's oilseed output. It is also grown in India, albeit to a considerably lesser extent India produces only around 3% of the world's oilseeds. Whereas the majority of other crops and oilseeds struggle to grow, Niger seed does well on wet soils. This makes it a crucial crop for Ethiopia, where waterlogged soils are a significant issue, to save soil and restore damaged land.

Niger is a two-cotyledon annual herb. The cotyledons arise above the soil surface during the epigeal germination process. The cotyledons are long-lasting and range in color from pale green to brownish. The successive leaves get bigger after the first pair of small, paired leaves. On the stem, the leaves are arranged in opposition to one another, but at the stem's apex, they are arranged alternately. The hue of the leaf can range from light green to dark green, and the leaf border can be smooth or pointed. The plant is often moderately to heavily branched, and the niger stem is typically smooth to slightly rough. Niger stems are hollow and easily breakable. The number of plant branches Light, sandy soils with low fertility are often used to cultivate crops in Niger. It can be farmed either as a monoculture or as an intercrop. When intercropped, the principal crop in Niger receives the land preparation and culture. Niger seed has a total ash content of 4.58%, which is made up of phosphoric acid (1.35%), lime (0.12%), acid soluble chloride (0.02%), and acid insoluble chloride (1.01%).

Niger oil is a bluish-white, sweet-tasting edible oil with a mild odor. Utilizing any kind of oil expeller, it is removed. Other important characteristics of the oil include:

- Specific gravity: 0.9157
- Refractive index: 1.446 at 40 °C
- Melting point: 73 to 85 °C
- Acetyl value: 24.1

- Saponification value: 194.6
- Reichert-Meissl number: 0.85
- Iodine value: 126.4
- Bromine absorption: 79.8%
- Insoluble fatty acid: 94.3%

The oil contains 85.4% unsaturated and 14.0% saturated fatty acids. Lauric and myristic acids account for 5.4%, stearic acid 4.8%, arachidic and ligneceric acids 0.48%. Among the unsaturated acids, oleic acid 38.7% and linoleic acid 51.6% are the major ones.

The digestible nutrients in niger seed cake include fats 5.2%; protein 29.8%; carbohydrates 21.7%; and fiber 3-9%. Niger seed cake is also used as a manure. The manure value is as follows: 1) Nitrogen: 4.73% 2) Phosphate: 1.83% 3) Potash: 1.31% Niger is a rainfed crop that is grown in resource-poor and risk-prone areas. Because of this, the area and production of niger vary according to the patterns of rainfall in the growing regions. Additionally, the productivity of niger fluctuates depending on the prevailing weather conditions during the crop season. Niger is often considered a poor man's crop and is grown on poor lands in hilly regions by tribal farmers. Traditional varieties are typically grown with little attention and no or limited use of fertilizers or other agrochemicals, resulting in low crop yields. Research has shown that the productivity of niger can be significantly improved by growing improved crop varieties and using fertilizers. Niger responds variably to the application of nutrients, as it is grown in heterogeneous agro-climatic conditions. This study critically reviews these research findings to identify the appropriate nutrient management for improving the productivity of niger. The effect of integrated nutrient management on the growth and yield of Niger (*Guizotia abyssinica* L.) was the subject of an experiment.

Material and Methods

An agronomic analysis was carried out to determine the impact of integrated nutrient management on the growth and yield of niger during the kharif season of 2021–2022 at the Experimental Farm of the Department of Agronomy, College of Agriculture, Latur. The experimental site had a clay-like texture and reacted slightly alkalinely. The soil's available nitrogen content was lower (227 kg ha^{-1}), its available phosphorus content was average (16.90 kg ha^{-1}), and its available potassium content was higher (434 kg ha^{-1}). The soil had adequate water retention capacity and was well-drained.

Nine treatments were duplicated three times in the randomized block design (RBD) experiment. The treatments were T_1: Control, T_2: 50% RDF + *Azotobacter* + PSB, T_3: 75% RDF + *Azotobacter* + PSB, T_4: 50% RDF + Vermicompost + PSB, T_5: 75% RDF + Vermicompost + PSB, T_6: 50% RDF + Vermicompost + *Azotobacter* + PSB, T_7: 75% RDF + Vermicompost + *Azotobacter* + PSB, T_8: 50% RDF + Neem seed cake + *Azotobacter* + PSB, T_9: 75% RDF + Neem seed cake + *Azotobacter* + PSB. Each experimental unit's gross and net plot sizes were 5.4 m × 4.5 m and 4.5 m x 3.9 m, respectively. On July 17, 2021, seeds were sown using the dibbling method with a seed rate of 5 kg ha^{-1}. 40: 20: 00: kg NPK $ha^{-1}$was the RDF for the niger crop. Gross plot dimensions for each experimental unit in the study were 5.4 by 4.5 meters, while net plot dimensions were 4.5 by 3.9 meters. On July 17, 2021, as per the protocols, pure seed of the niger variety GNNIG-3 was sowed using the dibbling technique. The harvest took place on October 24, 2021.

Results & Discussion

Gross monetary return (₹.ha^{-1})

Data concern with the gross monetary return (GMR) of various treatments are presented in Table 1, Fig. 1. The mean gross monetary return obtained from niger crop was 53875 ₹. ha^{-1}. Highest GMR obtained from the application of 75% RDF + Vermicompost + Azotobacter + PSB (T_7) (60605 ₹. ha^{-1}) which was found at par with application of 75% RDF + Neem seed cake + Azotobacter + PSB (T_9) and application of 75% RDF + Vermicompost + PSB (T_5) which was significantly superior over rest of treatments.

Cost of cultivation (₹.ha^{-1})

Data concern with the cost of cultivation (CC) of various treatments are presented in Table 1. The highest cost of cultivation required for the application of 75% RDF + Vermicompost + Azotobacter + PSB (T_7) was 38315 ₹. ha^{-1}. The lowest cost of cultivation required for the control (T_1) treatment was 23170 ₹. ha^{-1}. The mean cost of cultivation for different was 31355 ₹. ha^{-1}

Net monetary return (₹.ha^{-1})

Data in respect of net monetary return of niger was influenced by different treatments are presented in Table 1. The treatment application of 75% RDF + Neem seed cake+ Azotobacter + PSB (T_9) was received highest NMR (31525 ₹. ha^{-1}) which was found at par with application of 75% RDF + Azotobacter + PSB (T_3) and application of 50% RDF + Neem seed cake + Azotobacter + PSB (T_8) which was found significantly superior over rest of treatments.

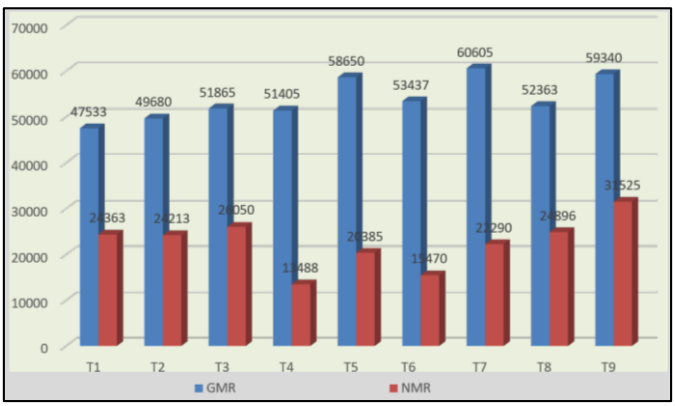

Fig 1: GMR and NMR of niger as influenced by different treatments

Table 1: Effects of several treatments on economics of the niger.

Treatments	Seed yield	GMR	Cost of cultivation	NMR
T_1 Control	413	47533	23170	24363
T_2 50% RDF + *Azotobacter* + PSB	432	49680	25467	24213
T_3 75% RDF + *Azotobacter* + PSB	451	51865	25815	26050
T_4 50% RDF + Vermicompost + PSB	447	51405	37917	13488
T_5 75% RDF + Vermicompost + PSB	510	58650	38265	20385
T_6 50% RDF + Vermicompost + *Azotobacter* + PSB	465	53437	37967	15470
T_7 75% RDF + Vermicompost + *Azotobacter* + PSB	527	60605	38315	22290
T_8 50% RDF + Neem seed cake + *Azotobacter* + PSB	455	52363	27467	24896
T_9 75% RDF + Neem seed cake + *Azotobacter* + PSB	516	59340	27815	31525
SEm ±	19.30	2219.81	-	2219.81
CD at 5%	57.86	6655	-	6655
General Mean	468	53875	31355.33	22520

Conclusion

The application of 75% RDF + Vermicompost + Azotobacter + PSB (T_7) had a substantial impact on seed yield, (NMR) net monetary return, and benefit-cost ratio, or (B:C) i:e, (2.13) were obtained.

According to the findings of a year's worth of research, applying 75% RDF, vermicompost (2.5 t ha^{-1}), azotobacter (10 ml/kg), and PSB (10 ml/kg) boosts niger's quantitative and qualitative yield along with economics.

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