



Research Article

EFFECT OF TOPPING ON GROWTH, SEED YIELD AND ECONOMICS OF NIGER [*Guizotia abyssinica* (L.f.) Cass.] UNDER EASTERN GHAT HIGH LAND ZONE OF ODISHA

DALEI B.B.*, MEENA M.K., MOHAPATRA P.M., SAHOO B.B., PHONGLOSA A. AND PRADHAN K.

Regional Research and Technology Transfer Station, Semiliguda, 763002, Orissa University of Agriculture and Technology, Bhubaneswar, 751003, Odisha, India

*Corresponding Author: Email - b_dalei@rediffmail.com

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Abstract: The field experiment was carried out at Regional Research and Technology Transfer Station (OUAT), Semiliguda of Koraput district under Eastern Ghat High Land zone of Odisha during kharif season of 2012 & 2013 to study the effect of topping operation on growth and yield of niger (*Guizotia abyssinica*). The results revealed that niger cv. Utkal Niger-150 recorded maximum seed yield of 541.4 kg/ha with respect to the varieties and the treatment having topping at capitula initiation stage (35 DAS approx.) recorded maximum seed yield of 549.7 kg/ha which was at par with the seed yield recorded with no topping operation (543.9 kg/ha) and topping operation at 10 days before capitula initiation stage (25 DAS approx.) with seed yield of 532.8 kg/ha. No topping recorded the highest net monetary return of Rs.5282/ha and benefit cost ratio of 1.6 followed by topping operation at 10 days before capitula initiation stage (25 DAS approx.) with net monetary return of Rs.4451/ha and benefit cost ratio of 1.4.

Keywords: Niger, variety, topping, seed yield, economics

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Introduction

Niger (*Guizotia abyssinica* (L.f.) Cass.) the important oilseed crop is most hardy and drought tolerant occupying a prominent place where moisture is the limiting factor and soils are sub-marginal to marginal in several parts of the country. It is grown in India in an area about 2.99 lakh ha with a production of 0.98 lakh tones and a productivity of 327 kg/ha [1]. In the state of Odisha, it covers an area of 0.65 lakh ha with a production of 0.23 lakh tonnes and productivity of 360 kg/ha [1]. In the process of topping the terminal portion of the uppermost node is removed in order to enhance the functioning of lower leaves by stunning the unnecessary growth, declining shading of leaves, increasing light interception and nutrient uptake, lessening competition for plant nutrients between tassel and cob and diverting plant nutrients to the reproductive part for better development of cob for increasing yield in Maize crop [2]. In Sesame crop it was found that nipping of the terminal bud activates the dormant lateral buds for producing more branches and ultimately the yield was increased [3]. This could be attributed to overall improvement in plant vigour leading to initiation of larger number of branches and ultimately better manifestation of yield attributes in sesame [4]. Topping can remove significant weight and wind foil from the top of the plant and prevent the plant from being blown over during wind gusts or rain storms [5]. In Niger, a few research information on these aspects is available. The present investigation was therefore carried out to study the effect of topping in niger.

Materials and methods

The field experiment was carried out at research farm of Regional Research and Technology Transfer Station (OUAT), Semiliguda of Koraput district under Eastern Ghat High Land zone of Odisha during kharif seasons of 2012 & 2013. The farm is situated at 18°42'N latitude, 82°30'E longitude and an altitude of 884.0 m. The soil of experimental site was red, sandy to clay loam in texture & acidic in reaction (PH=5.8) with available N (170 kg/ha), available P (16 kg/ha) & available K (145 kg/ha) contents.

Eight treatments comprising of different topping operations and varieties of niger as given in [Table-1] were evaluated in factorial randomized block design with three replications for statistical analysis. The niger seed was sown with seed rate of 10 kg/ha in row 30 cm apart on August 11 and 13 during the year 2012 and 2013 respectively. The intra-row spacing of 10 cm was maintained by thinning operation. The thinning & weeding operations were carried out on 15 & 21 days after sowing in every year under the experimentation. The topping operations were carried out as per the treatments. The recommended dose of fertilizer (40:40:20 NPK kg/ha) was applied to the crop as per treatment. Full dose of P, K & ½ N in form of DAP, MOP & Urea respectively as basal and rest ½ N after three weeks of sowing was applied to the crop. The crop was harvested on December 21 & 14 during 2012 & 2013 respectively.

Results and discussion

Growth and Yield attributes

The taller plants with plant height of 219.1 cm and maximum number of seeds per capitula (30.7) were recorded with no topping (T4) whereas shorter plants with plant height of 201.8 cm was recorded with the treatment having topping operation at 10 days before capitula initiation (CI) stage (25 DAS approx.) i.e., T2 [Table-1]. As in topping operation, the apical bud is nipped the utilization of the photosynthates by the crop for lateral branches could be higher and this might be the reason with decreased plant height with topping treatments. Similar results were also reported by Sharma, et al., (2006) [13], Singh, et al., (2013) [7] and Kithan and Singh, (2017) [8]. The mean maximum branches/ plant (6.9) was recorded with topping at 10 days after CI stage (45 DAS approx.) i.e., T3 and minimum (6.5) with topping at CI stage (35 DAS approx.) i.e., T1. The treatment having topping operation at 10 days before CI stage (25 DAS approx.) i.e., T2 recorded maximum number of capitula per plant (96.8) whereas no topping (T4) recorded the minimum (60.4).

Table-1 Effect of topping on growth parameters and yield attributes of Niger (Pooled data of 2012 and 2013)

Treatments	Plant height (cm)	Branches/plant	Capitula/plant	Seeds/capitulae
Variety				
V1.Deomali	212.6	6.6	91.3	30.1
V2.UtkalNiger 150	206.7	6.8	93.5	30.5
S.E.(m) ±	4.1	0.2	2.3	0.8
C.D.(P=0.05)	NS	NS	NS	NS
Topping				
T1. Topping at CI stage (35 DAS approx.)	211.4	6.5	87.9	29.6
T2. Topping at 10 days before CI stage (25 DAS approx.)	201.8	6.8	96.8	30.3
T3. Topping at 10 days after CI stage (45 DAS approx.)	206.8	6.9	94.9	30.4
T4. Control (No topping)	219.1	6.7	60.4	30.7
S.E.(m) ±	5.9	0.3	3.2	1.1
C.D.(P=0.05)	17.6	0.8	9.9	3.3

Table-2 Effect of topping on seed yield and economics of Niger (Pooled data of 2012 and 2013)

Treatment	Seed yield (kg/ha)	Economics		
		Cost of production (Rs/ha)	Net Monetary Return (Rs/ha)	B:C Ratio
Variety				
V1.Deomali	522.5	13692	3849	1.3
V2.Utkal Niger 150	541.4	13692	4512	1.4
S.E.(m) ±	16.6	-	-	-
C.D.(P=0.05)	NS	-	-	-
Topping				
T1. Topping at CI stage (35 DAS approx.)	549.7	13965	4451	1.4
T2. Topping at 10 days before CI stage (25 DAS approx.)	532.8	13965	4090	1.3
T3. Topping at 10 days after CI stage (45 DAS approx.)	451.4	13965	2897	1.2
T4. Control (No topping)	543.9	12873	5282	1.6
S.E.(m) ±	23.5	-	-	-
C.D.(P=0.05)	71.2	-	-	-

The practice of topping of terminal bud might have efficiently altered the crop Effect of architecture by activating the dormant lateral branches that led to increase in the number of capitula per plant. Kithan and Singh, (2017) [8] and Singh, *et al.*, (2013) [7] also reported similar results in sesame. This was also explained by Bharathi, *et al.*, (2014) [9] and Patel, *et al.*, (2014) [10].

Seed Yield

The seed yields of crop are generally governed by various yield attributing characters. The treatment having topping operation at CI stage (35 DAS approx.) recorded highest seed yield of 549.7 kg/ha which was at par with the treatment having no topping with seed yield of 543.9 kg/ha and the treatment having topping operation at 10 days before capitula initiation (CI) stage (25 DAS approx.) with seed yield of 532.8 kg/ha [Table-2]. Baloch and Zubair, (2010) [11] reported similar results in chickpea. The results are also corroborated to that of Khan, *et al.*, (2017) [12]. Increased in seed yield with topping operation might be due to increased lateral branches that led to increase in the number of capitula per plant and number of seeds per capitula. Narayanan and Narayanan, (1987) [13] also reported favourable effect of nipping on seed yield in sesame. These findings are in accordance with those of Kithan and Singh, (2017)[8].

Economics

The input and output prices of commodities prevailed during each year of trial were taken for calculating cost of production, net monetary return and benefit: cost ratio [Table-2]. No topping operation recorded highest NMR (Rs.5282/ha) and B:C ratio (1.6) followed by topping operation at CI stage (35 DAS approx.) with NMR (Rs.4451/ha) and B:C ratio (1.4). Similar results were reported in chickpea by Khan, *et al.*, (2017) [14]. The cost of production was lower (Rs.12873/ha) in no topping operation than in other treatments having topping operation (Rs.13965/ha). It can be inferred that no topping operation proved to be more remunerative than topping operation.

Conclusion

It was concluded from the experiment that no topping operation could confer more seed yield and monetary returns than topping operation in niger under Eastern Ghat High Land zone of Odisha.

Application of research: The experiment will be helpful to farmers in minimizing the cost of cultivation of niger and better management of valuable time and resources for different agricultural operations.

Research Category: Agriculture production technology

Abbreviations:

DAP- Diammonium Phosphate
MOP- Muriate of Potash
DAS- Days After Sowing

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***Research Guide or Chairperson of research:** Bibhuti Bhusan Dalei

University: Orissa University of Agriculture and Technology, Bhubaneswar, Odisha 751003

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