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Yield performance of Niger and their improved variety in Mandla district under northern hill of Chhattisgarh zone of Madhya Pradesh

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Abstract
An On Farm Testing (OFT) trial was carried out to compare the yield performance of niger variety at farmers' field in Mandla district (Northern Hill of Chhattisgarh Zone), Madhya Pradesh, India during *Kharif* season 2015 and 2016. All the improved package and practices (IP) was applied with improved Niger variety (JNS-9) while local farmer's variety was as it is with their existing farmers' practices (FP). The results revealed that the average seed yield was 856.50 kg/ha in IP while it was 389.00 kg/ha in FP. The average seed yield was increased by 120.26% in the IP over the FP. The average extension gap was recorded 467.50 kg/ha over the FP. The average technology gap in IP of Niger over the FP was recorded 143.50 kg/ha whereas, average technology index was 14.35%. The average cost of cultivation under IP was Rs.7840.00/ha with net return of Rs. 26420.00/ha and B:C ratio 3.37 while it was Rs. 5586.00/ha with net return Rs. 9974.00/ha and B:C ratio 1.80 under FP. On an average Rs. 16446/ha was recorded as additional income which significantly attributed due to the adoption of recommended package and practices including improved Niger variety.

Keywords: Niger, *Guizotia abyssinica*, yield performance, extension gap, technology gap, net return

Introduction
Niger (*Guizotia abyssinica* (L.f.) Cassini) belongs to the family Asteraceae is one of the important minor oil seed crops of tribal community in India. It is also commonly known as Ramtil, Ramtilla, Jagni and black seed. Generally, it is grown by the poor and small farmers who live in hilly, tribal belts and adjacent the forest area whereas its cultivation is ignored by big and marginal farmers. It is cultivated in poor soil, undulated and dry land area with minimum agro inputs. This crop is grown mainly for its oil and seed. The niger seed contain about 35-40 per cent oil with fatty acid composition of linoleic acid 75-80 per cent, palmitic and stearic acids 7-8 per cent and oleic acid 5-8 per cent. The oil of niger seeds is used to prepare different types of dietary foods, paints, soaps and as an illuminant. Niger can be easily processed to replace partial or full petroleum based diesel fuel as an alternate resort of bio-fuel (Sarin *et al.*, 2009) [15].

India ranks the largest producer and exporter of niger. It is grown in marginal lands in the states of Madhya Pradesh, Orissa, Chhattisgarh, Maharashtra and to a lesser extent in Gujarat, Karnataka, Andhra Pradesh, Assam, West Bengal and Jharkhand (Anonymous, 2018-19) [3, 4]. In Madhya Pradesh, it is cultivated in 61.30 thousand ha area with the production of 21.09 thousand metric tones and productivity of 344 kg/ha. In Mandla district, it is cultivated in 4.25 thousand ha area with production of 1.92 metric tones and productivity of 451 kg/ha (Anonymous, 2019) [3, 4]. Since last decade it is noticed that its cultivated area is being shrinked gradually due to lack of proper extension of improved agriculture based interventions, knowledge and awareness in the farmers' community (Table 1). In this respect the agriculture scientists, extension workers and agriculture department play pivotal role to reach out the technologies to farmers' levels (Patil *et al.*, 2018) [11]. This is a big challenge for the extension scientist and workers to tackle the current situation of farmers. Thus, the present investigation was carried out to know the yield performance of improved package and practice of niger with existing farmers' practices to enhance the niger production.

Materials and Methods

An investigation was carried out under on farm testing trial (OFT) to evaluate the yield performance of niger and their improved variety at farmers' filed in Mandla district by Krishi Vigyan Kendra, Mandla Madhya Pradesh, India during *Kharif* season 2015 and 2016. Before conduction of OFT's, a field survey was done and held meeting with the farmers to convince them regarding improved package and practices of niger cultivation. A total number of 24 OFTs were conducted in area of 0.4 ha each with adjacent plot of local practices of farmers field (three villages *viz*; Semarkhapa, Kindri and Bakchheradona). The soil status under demonstrated area was light with medium to high fertility. The improved package of practices (IP) under OFT was included such as improved variety of niger (JNS-9), seed rate @ 5 kg/ha, seed treatment with Thirum + Bavistin 2:1 @ 2.5 g/kg seed and *Trichoderma virdae* @10 g/kg of seed, bio-inoculants (Rhizobium + Phosphorus solubilizing Bacteria (PSB)) @ 20 gm/kg seed), line sowing with spacing of 30 x 10 cm (RxP), fertilizer doses @ 20:20:20:20 NPKS kg/ha (Half dose of N + full dose of P + full dose of K + full dose of Sulphur as basal and half dose N as top dressing at 35 DAS), one hand weeding at 25-35 DAS. Under the plant protection measures only one spray of in insecticide was done i.e. Quinalphos 25 EC @ 1.5 liter/ha with the solution of 500 liter water. Other hand in the farmers' practices (FP) included were only field preparation with two ploughing, local seed @ 9-10 kg/ha and broadcasting without any weeding and plant protection measures (Table 2). The crop seed was sown from 25th July to 10th August. The crops were harvested at full maturity stage by manually and the data were collected through personal contact with OFTs farmers and data was subjected to statistical analysis to evaluate the yield performance of OFTs and farmers' field. Finally the extension gap, technology gap and index along with the benefit cost ratio were worked out using the formula as suggested by Samuai *et al.*, (2000) [14].

Extension gap = Demonstration yield – farmers practices yield.

Technology gap = Potential yield of variety – Demonstration yield.

Technology index (%) = Technology gap/Potential yield x 100.

B: C ratio = Net income (Rs./ha) / cost of cultivation (Rs./ha)

Yield increase over FP (%) = Improved practices – Farmers practices / farmers practices x 100

Table 1: Area, production and productivity of Niger in India, average of three years (2013-14 to 2015-16*)

S. No.	State	Area (lakh ha)	Production (lakh MT)	Yield (Q/ha)
1	Madhya Pradesh	0.66	0.23	3.55
2	Odisha	0.66	0.24	3.58
3	Chhattisgarh	0.63	0.11	1.74
4	Maharashtra	0.23	0.06	2.42
5	Gujarat	0.10	0.04	5.21
6	Karnataka	0.10	0.02	3.08
7	Andhra Pradesh	0.08	0.04	4.78
8	Assam	0.07	0.04	5.95
9	West Bengal	0.04	0.03	7.13
10	Jharkhand	0.03	0.02	5.90
	All India	2.61	0.84	3.21

* Anonymous. (2015-16) [2] * Fourth Advance Estimates (2015-16),

***Source*:** Directorate of Economics and Statistics, Ministry of Agriculture & Farmers' Welfare, New Delhi

Table 2: Gap analysis between on farm testing (OFT's) practices and farmer's practices (FP)

Technologies	OFT's practices	Farmer's practices	Gap
Land preparation	Two ploughing	Two ploughing	No gap
Variety	JNS-9	Local seed	Full gap (100%)
Seed rate (kg/ha)	5 kg/ha	9-10 kg/ha	Higher seed rate
Seed treatment	Thirum + Bavistin 2:1 @ 2.5 g/kg seed and *Trichoderma virdae* @10g/kg of seed	No seed Treatment	Full gap (100%)
Sowing method and spacing	Line sowing (30 cm x 10 cm respectively)	No Line sowing (Broadcasting method)	Full gap (100%)
Manures and Fertilizers	20:20:20:20 NPKS kg/ha(Half N_20+ Full P_2O5+Full K_2O+Full S as basal dose) and Half nitrogen after 35 DAS	No use of fertilizer	Full gap (100%)
Weed management	One hand weeding at 25-35 DAS	No weeding	Full gap (100%)
Insect pests management	Need based plant protection measurement	No plant protection measurement	Full gap (100%)

Results and Discussion

Yield performance

The data presented in Table 3 depicted that the seed yield of niger from improved package of practices (IP) was 850 and 863 kg/ha as compared to 395 and 383 kg/ha in farmers practice (FP) during *Kharif* 2015 and 2016, respectively. The average seed yield recorded was 856.50 kg/ha in IP while it was 389.00 kg/ha in FP. In the IP, the increased seed yield over the FP was recorded higher 115.19% and 125.33% during 2015 and 2016, respectively. The average seed yield over the FP was increased by 120.26%. This result revealed that increase in seed yield in the IP is mainly expressed due to adoption of recommended package of practices and use of high yielding niger variety (JNS-9) particular in Mandla district where farmers are not practice any improved technological interventions. The present findings are corroborated with the findings of Patil *et al.*, (2010) [12], as they reported on groundnut and soybean under FLDs. Similar findings were also reported by Meena *et al.*, (2012) [8], Meena and Singh (2013) [9] and Dalei *et al.*, (2016) [6] on mungbean, mustard and niger crop, respectively.

Table 3: Performance of improved technology under OFTs on the productivity of niger

Year	Area (ha)	No of OFT's	Variety	Average Yield kg/ha			Yield increase over FP (%)	Extension gap (kg/ha)	Technology gap (kg/ha)	Technology index (%)
				Potential	IP	FP				
2015	4.8	12	JNS-9	1000	850	395	115.19	455	150	15.00
2016	4.8	12	JNS-9	1000	863	383	125.33	480	137	13.70
Total	9.6	24	-	2000	1713	778	240.52	935	287	28.70
Average	4.8	12	-	1000	856.50	389	120.26	467.50	143.50	14.35

OFT: On Farm Testing, IP: Improved package of practices, FP: Farmers' practices

Extension gap: The perusal of data presented in the Table 3 clearly indicated that the extension gap i.e. 455 and 480 kg/ha was recorded during the year 2015 and 2016, respectively between IP and FP. Further, the average extension gap was recorded 467.50 kg/ha over the FP. This is also might be attributed due to adoption of recommended package and practices in the thrust area of Mandla district where farmers are apparently much deprived due lack of knowledge and awareness. The present results are the full agreement with the results of Dalei *et al.,* (2016) [6] and Romade *et al.,* (2019) [13], as they also reported that the difference between IP and FP absolutely attributed due to lack of knowledge and awareness in the beneficiary farmers to the IP.

Technology gap and index: The technology gap in IP of niger (JNS-9) over the FP was recorded 150 and 137 kg/ha during 2015 and 2016, respectively and average technology gap was recorded 143.50 kg/ha (Table 3). Further, technology index was calculated 15% and 13.70% during 2015 and 2016, respectively whereas, average technology index was 14.35%. This result ubiquitously revealed that lower value of technology index exhibited about the more probable feasibility of the niger variety (JNS-9) at the FP. Present findings advocated that the technology gap and index are significantly existed between the IP and FP due to extension gap and transfer technology of improved package of practices. The present results are the full agreements with the results of Kushore and Sahane (2011) [7], Dalei *et al.,* (2016) [6] and Romade *et al.,* (2019) [13], as they also reported on niger crop.

Economic return

The economic analysis presented in Table 4 indicated that the cost of cultivation was recorded Rs. 7685.00 and 7995.00/ha with net return of Rs. 26315.00 and 26525.00/ha and B:C ratio 3.42 and 3.32 during 2015 and 2016, respectively under IP than that of FP in which the cost of cultivation was recorded Rs. 5380.00 and 5792.00/ha with net return of Rs. 10420.00 and 9528.00 and B:C ratio 1.94 and 1.65. The average cost of cultivation under IP was Rs.7840.00/ha with net return of Rs. 26420.00/ha and B:C ratio 3.37 as compared to the cost of cultivation under FP having Rs. 5586.00/ha with net return Rs. 9974.00/ha and B:C ratio 1.80. Finally on an average Rs. 16446/ha was recorded as additional income which significantly attributed due to the adoption of recommended package and practices including improved niger variety (JNS-9). Similar results were reported by Kushore and Sahane (2011) [7], Dalei *et al.,* (2016) [6], Ahirwar *et al.,* (2018) [1], Romade *et al.,* (2019) [13] and Bhoite *et al.,* (2020) [5], as they also indicated that the front line demonstration of niger with recommended package and practices has given a good impact over the farming community.

The conclusion of the present investigation emphasizes that whatever extension and technology gaps are existed should be filled out by conducting demonstrations, training schools, meetings for the livelihood and welfare of farmers' community particularly in remote tribal areas where farmers are neither aware with new technological interventions nor well educated.

Table 4: Profitability of improved variety of niger crop through On Farm Testings (OFT's)

Year	Average cost of cultivation (Rs./ha		Average grass return (Rs./ha		Average net return (Rs./ha		B:C ratio	
	IP	FP	IP	FP	IP	FP	IP	FP
2015	7685	5380	34000	15800	26315	10420	3.42	1.94
2016	7995	5792	34520	15320	26525	9528	3.32	1.65
Total	15680	11172	68520	31120	52840	19948	6.74	3.59
Average	7840	5586	34260	15560	26420	9974	3.37	1.80

IP: Improved package of practices, FP: Farmers' practices

References

1. Ahirwar AD, Tiwari VN, Paradkar VK. Impact of Front Line Demonstration on the yield of niger. International Journal of Current Microbiology and Applied Sciences 2018;7(12):2247-2251.
2. Anonymous. Directorate of Economics and Statistics, Ministry of Agriculture & Farmers' Welfare, New Delhi 2015-16.
3. Anonymous. Fourth advance estimates of area, production and yield of mustard. Agriculture Statistics Department of Agriculture, Government of Rajasthan 2018-19.
4. Anonymous. http://mpkrishi.mp.gov.in/hindisite_New/APY%202016-17_to_201819.pdf.
5. Bhoite K, Romade B, Pardeshi S. Impact of front line demonstration on the yield of niger in western Ghat Zone of Maharashtra. Journal of Pharmacognosy and Phytochemistry 2020;9(5):1803-1805.
6. Dalei BB, Meena MK, Nayak L, Behera BR, Sahoo BB, Senapati N. Impact of Front Line Demonstration on Production and Productivity of Niger [*Guizotia abyssinica* (L.f.) Cass] in Eastern Ghat High Land Zone of Odisha. International Journal of Bio-resource and Stress Management 2016;7(3):477-479.
7. Kushore BM, Sahane UG. Front line demonstration- An effective tool for increasing productivity of Niger in Thane district of Maharastra. International Journal of agricultural Sciences 2011;7(2):415-417.
8. Meena BL, Meena RP, Meena RH, Balai CM. Yield gap analysis of rapeseed-mustard through front line demonstrations in agro climatic zone IVa of Rajasthan. Journal of Oilseed Brassica 2012;3(1):51-55.

9. Meena ML, Singh D. Front line demonstration for boosting the oilseed production in Rajasthan: A case study in Pali. Journal of Oilseeds Research 2013;30(1):51-54.
10. Meena OP, Sharma KC, Meena RH, Mitharwal BS. Technology transfer through FLDs on Mungbean in semi arid region of Rajasthan. Rajasthan Journal of Extension Education 2012;20:182-186.
11. Patil SS, Mahale MM, Chavan SKS. Impact of frontline demonstration on oilseed crops in South Konkan coastal zone of Maharastra. Current Agriculture Research Journal 2018;6(3):355-364.
12. Patil VG, Mahajan SJ, Patil CH, Deshetti AS, Sarode PN. Front line demonstration-An effective tool for increasing the productivity of groundnut and soybean in Jalgaon district of Maharashtra: International Journal of agriculture Sciences 2010;6(1):88-90.
13. Romade BD, Bhoite KD, Pardeshi SR. Impact of front line demonstration on production and productivity of Niger [*Guizotia abyssinica* (L.f.) Cass] in Western Ghat Zone of Maharashtra. Journal of Pharmacognosy and Phytochemistry 2019;8(1):1569-1571.
14. Samui SK, Mitra S, Roy DK, Mandal AK, Saha D. Evaluation of front line demonstration on groundnut. Journal of Indian Society of Coastal Agricultural Research 2000;18(2):180-183.
15. Sarin R, Sharma M, Khan AA. Studies on *Guizotia abyssinica* L. oil: biodiesel synthesis and process optimization. Bioresource Technology 2009;100:4187-4192.