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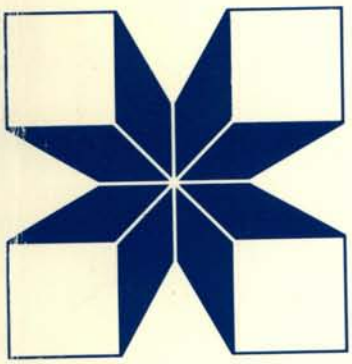

CANADA

OIL CROPS:
PROCEEDINGS OF THE THREE MEETINGS HELD AT PANTNAGAR AND HYDERABAD, INDIA, 4 – 17 JANUARY 1989

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This series includes meeting documents, internal reports, and preliminary technical documents that may later form the basis of a formal publication. A Manuscript Report is given a small distribution to a highly specialized audience.

La présente série est réservée aux documents issus de colloques, aux rapports internes et aux documents techniques susceptibles d'être publiés plus tard dans une série de publications plus soignées. D'un tirage restreint, le rapport manuscrit est destiné à un public très spécialisé.

Esta serie incluye ponencias de reuniones, informes internos y documentos técnicos que pueden posteriormente conformar la base de una publicación formal. El informe recibe distribución limitada entre una audiencia altamente especializada.

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1. The Brassica Subnetwork-II
2. The Other Oil Crops Subnetwork-I
3. The Oil Crops Network Steering Committee-I

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Part 3. Oilcrops Network Steering Committee-I

NIGER IN TRIBAL BIHAR

H.B.P. Trivedi

Tribal Bihar with a geographical area of 79710 km^2, comprises plateau, sub-plateau and foot-hills of south Bihar. The area is administratively known as Chotanagpur and Senthal Parganas. This region is largely inhibited by schedule tribes, schedule castes and other rural communities who have adapted tribal way of life. They account for about 60% of the total population. More than 70% of the farmers belong to the poor socio-economic group and are small and marginal farmers.

The climate of this region, in general, is sub-humid megathermal with large winter water deficiency. The variation in the total amount of rainfall is very high (900 mm to 1500 mm), the average for the last 30 years is about 1350 mm. About 90% of the total precipitation takes place during kharif season i.e., June to September and the rest received during winter. Even during kharif season, drought spells of 4 to 6 weeks duration are not uncommon. Rainfall is not evenly distributed throughout the season and sharp peaks have been observed in Monsoon months.

The agro-climatic conditions prevailing in this tribal belt and the socio-economic status of the farmers are best suited for pulses and oilseeds cultivation. Among oilseeds, niger (*Guizotia abyssinica* Cass) possesses unique characteristics to withstand heavy downpour as well as moisture stress and can very well establish in pebbled, shallow, poor soil which is prevalent in uplands of this region where it is commonly grown, where nothing else can be grown and can easily be seen from valleys to hill tops. This crop has least disease and pest problems.

Status of niger

India is one of the principal niger growing countries where it is grown in 5.8 lakh hectares with annual production of 1.53 lakh tons. Bihar state ranks fourth in national scenario in acreage and also in production, its share being 9.79 and 10.08 %, respectively in acreage and production of the nation, Table 1.

Table 1. Area, production and productivity of niger in India.

States	Area		Production		Productivity
	('000 ha)	(%)	('000 tons)	(%)	(kg/ha)
Madhya Pradesh	224.9	38.47	40.8	28.75	181
Orissa	137.2	23.47	57.6	30.77	420
Maharashta	101.0	17.27	24.1	18.80	239
Bihar	56.9	9.79	16.9	10.08	269
Kernataka	53.7	9.18	9.3	8.09	173
Andhra Pradesh	10.3	1.06	3.6	2.40	350
Dadar & Nagar Haveli	0.6	-	0.2	-	257
All India	584.6		152.5		266

Source: Agricultural situation in India, Oct. 1982.

In Bihar almost all the oilseed crops are grown viz., rapeseed and mustard (82,000 ha), linseed (85,200 ha), niger (56,900 ha) sesame (19,400 ha), groundnut (5,100 ha) and other oilseed in

2,100 ha. The total area under oilseed is 251,000 ha. Niger ranks third among oilseed crops, but among the kharif oilseed crops it ranks as No. 1 in Bihar state.

In Bihar, niger cultivation is totally confined to Chotanagpur and Santhal Paraganas. In this tribal region 57% of the total area under oilseed crops is occupied by niger. At the production front, 10.20 thousand tons is contributed by niger out of the total of 24.12 thousand tons of all oilseed production of the region. In other words, niger crop alone shares 42.47% of the total oilseed production (Table 2).

Table 2. Area and production of various oilseed crops in Chotanagpur and Santha Paraganas

	Area		Production	
Crops	('000 ha)	(%)	('000 tons)	(%)
Linseed	12.10	12.16	4.10	17.07
Rapeseed & Mustard	16.00	16.07	4.70	19.07
Sesame	12.20	12.26	2.34	9.74
Niger	56.90	57.17	10.20	42.47
Groundnut	2.33	2.34	2.68	11.15
Total	99.53		24.02	

Source: National Agril. Research Project, 1982.

Niger is seeded as a late kharif oilseed crop under rainfed condition in poor shallow, pebbled and low water retentive soil of the uplands. It is also grown as a second crop in the lands vacated after the harvest of Gundli *(Panicum miliare)*, Ragi and Gora paddy. Sometimes, it is also seeded mixed with Ragi, Urd and Gora paddy. In few districts, it is grown as border crop around Urd, Moong and Ragi crops, to deter the animals for grazing. This crop is mostly grown without any fertilizer application and proper crop management.

Crop improvement work

With the creation of Regional Agricultural Research Institute at Kanke, Govt. of Bihar had sanctioned a scheme for the improvement of various oilseed crops. While researches on other oilseed crops were started, niger could not get its proper place until mid sixties, when niger research could get its importance. Variety Ootacamund which matures in 120 days and produces 400 kg/ha has emerged as the most promising one among many entries tested for many years. This variety has been suggested for cultivation in place of local varieties in plateau region of Bihar.

Later on, Indian Council of Agricultural Research sanctioned a scheme on "Improvement of oilseed (niger)" in 5-years plan to give a major thrust for the improvement of this native oilseed crop of the region. Since then, concerted efforts are being made for the varietal improvement and crop management.

N-5, a variety from M.P. was identified as promising one over Ootacamund in maturity and in yield potential. N-5 matures in 95 to 100 days with yielding ability of 400-500 kg/ha. It has 40% oil in the seeds. Consequently, N-5 was recommended to farmers as an improved variety to replace Ootacamund. From then onwards, this variety is serving the interest of niger farmers for sowing as sole or second crop after the harvest of Ragi and Gora paddy.

More than 175 germplasm lines are being maintained by sibbing and are also being evaluated for various agronomic characters and yield components. Selected lines are being utilized for channelizing the desired genes in one gene pool. Correlation studies have revealed that selection based on number of capitulum per plant, plant height and number of secondary branches, independently or jointly may be

effective in increasing seed yield in niger. Divergence study revealed that the characters such as 1000-seed weight, days to maturity, capitulum diameter, plant height and yield per plant were the potential factors which contributed a lot towards divergence among the niger germplasm. Comp-2-3-4, KIC-24, KIC-27 and No. 71 were recognized as the potential parents, for exploitation of heterosis for seed yield.

A large number of single plants were selected on the basis of their phenotypic behavior from 13 elite populations. These selections were evaluated for several years for yield potential out of which seven progenies have been identified as outstanding. Three of them viz., N-5-2 (BNS-1), GA-11-1 (BNS-2) and GA-5-1 (BNS-3) have been entered in various AICORPO trials for multilocational evaluations.

Eighteen composites have been developed by utilizing germplasm lines which were early, late and superior in yield contributing characters. These bulks were evaluated for several years for their yield potential in replicated trials. Evaluation studies revealed the superiority of KEC-1, KEC-2, KEC-3, KEC-5, KEC-7, KEC-11 and BNC-120 over the local check. Five of them are being further evaluated in AICORPO trials.

Evaluation of a large number of varieties developed at other coordinating centres and at this centre in AICORPO trials and station trials revealed the superiority of the following varieties over the local and national checks.
These are listed below centerwise:

Kanke: BNC-120, KEC-1, and BNS-1
Maharastra : IGP-72
Karnataka : No.71, RCR-290 & RCR-18
Orissa : GA-1, GA-5 and GA-10
M.P. : N-5, N-35 and CHH-1.

Out of these high yielding varieties: N-5, KEC-1, BNS-1, CHH-1, No. 71 were identified as early whereas BNS-120, RCR-290, RCR-18, GA-1, GA-5 and GA-10 were found late in maturity.

Identification and Utilization of Male-Sterility

Male-sterility, in niger was, for the first time observed and identified, crop at Birsa Agricultural University. It was genetic male-sterility and found to be governed by recessive alleles. All bisexual tubular disc florets were modified into pistillate florets. Male-sterility is gyno-monoeceous. Though phenotypic marker for male sterility could not be identified in vegetative stage, the male-sterile plants could be pinpointed by their large sized buds. Identification of male-sterility has made possible for the large scale production of hybrids in this crop. Various types of hybrid lines have been produced at this centre with the male-sterile line. Evaluation of these hybrids unveiled that top-crossed hybrid (BNH-1) was superior in yield and yielded 7.2% more seeds than sibbed hybrid (BNH-2). Hybrid BNH-3 exhibited 20% heterosis over its male parent (BNC-120) in yield.

Crop-production

Experiments on crop-production have revealed that optimum time of sowing niger in Bihar plateau is between 15th and 30th of August. Plant population should be maintained at 250,000 to 300,000 ha for obtaining maximum seed yield. A distance of 30 cm from row-to-row and 12-15 cm from plant-to-plant is found suitable, when niger is grown in normal time, but when it is grown late i.e., in September, rows should be spaced narrower (25 cm) and plant-to-plant distance should be reduced to 10 cm.

To obtain an adequate plant stand, seed rate of 5-6 kg/ha is needed for normal sowing time and 7-8 kg/ha for late sown crop. Fertilizer dose of N_{20} P_{20} K_{10} kg/ha is found remunerative, however, response of N_{40} kg/ha has also been found. In crop sequence experiment, highest seed yield of niger is obtained from moong followed by niger. Intercropping results indicate that black gram, and ragi intercropped with niger (1:1) is more profitable than growing niger alone during kharif, whereas growing 3 rows of niger between paired rows of red gram is found to be more remunerative than other intercropping, Table 3.

Table 3. Effect of intercropping of niger with pulses on grain yield and niger equivalent yield (kg/ha).

Treatments	Yield (kg/ha)		Niger equivalent yield	Land equivalent ratio
	Niger	Intercrop		
Niger sole	262.4	-	342.9	1.00
Soybean sole	-	685.7	1496.1	1.00
Urid sole	-	1068.7	1763.9	1.00
Arhar sole	-	1102.4	758.2	1.00
Cowpea sole	-	1083.2	436.2	1.00
Moong sole	-	316.6	362.4	1.00
Soybean + Niger 1:1	285.5	302.5	441.8	1.23
Soybean + Niger 2:2	203.5	377.1	392.1	1.11
Urid + Niger 1:1	184.3	419.9	772.1	0.91
Urid + Niger 2:2	270.6	471.2	930.3	1.21
Arhar + Niger 1:1	257.0	752.1	1460.5	1.41
Arhar + Niger 2:3	392.2	630.5	1401.0	1.67
Cowpea + Niger 1:1	236.6	547.2	619.6	1.18
Cowpea + Niger 2:2	198.4	498.0	547.0	1.05
Moong + Niger 1:1	219.4	160.8	444.5	1.14
Moong + Niger 2:2	255.0	137.4	447.3	1.17
S.Em +			96.66	0.10
C.D. 5%			262.40	0.28
C.V. %			20.80	15.32