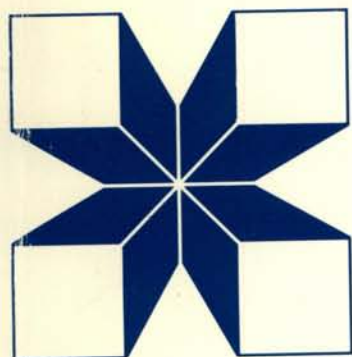


IDRC  
CRDI  
CIID



C A N A D A

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

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in six sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; earth and engineering sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

Le Centre de recherches pour le développement international, société publique créée en 1970 par une loi du Parlement canadien, a pour mission d'appuyer des recherches visant à adapter la science et la technologie aux besoins des pays en développement; il concentre son activité dans six secteurs : agriculture, alimentation et nutrition; information; santé; sciences sociales; sciences de la terre et du génie et communications. Le CRDI est financé entièrement par le Parlement canadien, mais c'est un Conseil des gouverneurs international qui en détermine l'orientation et les politiques. Établi à Ottawa (Canada), il a des bureaux régionaux en Afrique, en Asie, en Amérique latine et au Moyen-Orient.

El Centro Internacional de Investigaciones para el Desarrollo es una corporación pública creada en 1970 por el Parlamento de Canadá con el objeto de apoyar la investigación destinada a adaptar la ciencia y la tecnología a las necesidades de los países en desarrollo. Su actividad se concentra en seis sectores: ciencias agrícolas, alimentos y nutrición; ciencias de la salud; ciencias de la información; ciencias sociales; ciencias de la tierra e ingeniería; y comunicaciones. El Centro es financiado exclusivamente por el Parlamento de Canadá; sin embargo, sus políticas son trazadas por un Consejo de Gobernadores de carácter internacional. La sede del Centro está en Ottawa, Canadá, y sus oficinas regionales en América Latina, Africa, Asia y el Medio Oriente.

**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.**

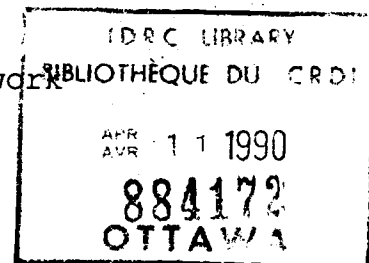
IDRC-MR252e  
February 1990

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

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

Edited by

Abbas Omran  
Technical Adviser, Oil Crops Network



Organized by

Indian Council of Agricultural Research, New Delhi, India  
G.G. Pant University of Agriculture and Technology,  
Pantnagar, India  
Directorate of Oilseeds Research, Hyderabad, India  
International Development Research Centre, Ethiopia/Canada

---

Material contained in this report is produced as submitted and has not been subjected to peer review or editing by IDRC Communications Division staff. Unless otherwise stated, copyright for material in this report is held by the authors. Mention of proprietary names does not constitute endorsement of the product and is given only for information.

# CONTENTS

Foreword .....	v
List of Participants .....	vi
Introduction .....	xi

## Part 1. Brassica Subnetwork-II

Opening Remarks. MAHATIM SINGH .....	2
Recent Development in Oilseed Brassicas. R.K.DOWNEY .....	4
The Interinstitutional Collaborative Research Program on White Rust ( <i>Albugo candida</i> ) Between India (ICAR) and Canada (IDRC) for Rapeseed-Mustard Improvement. P.R.VERMA .....	9
Stability Parameters for Seed Characters In Different Species of Oleiferous Brassica. H.SINGH, D.SINGH, and V.S. LATHER .....	14
Oilseed Brassica Research in India. P.R.KUMAR .....	17
Transfer of Technology and On-farm Trials of Rapeseed and Mustard. BASUDEO SINGH .....	24
Status of Breeding Research on brassica Oil Crops at Pantnagar, India. G.N.SACHAN .....	30
Agronomic Investigations on Rapeseed and Mustard at Pantnagar. ARVIND KUMAR and R.P. SINGH .....	35
Disease Problems in Brassicas and Research Activities at Pantnagar. S.J.KOLTE, R.P.AWASTHI and VISHWANATH .....	43
Effect of Some Epidemiological Factors on Occurrence and Severity of Alternaria Blight of Rapeseed and Mustard. R.P. AWASTHI and S.J.KOLTE .....	49
Problems of Insect Pests in Brassicas and Research Work at Pantnagar. G.C.SACHAN .....	56
Economic Performance, Potential and Constraints in Toria Production. L.R.SINGH .....	66
Rapeseed In Egypt. BADR A.EL-AHMAR .....	70
The Role of High-Yielding Varieties and Production Techniques on Oilseed Brassica Performance in the Central, South-Eastern and North-Western Zones of Ethiopia. HIRUY BELAYNEH, GETINET ALEMAW and NIGUSSIE ALEMAYEHU .....	72
The Achievements and Future of Brassica in Kenya. M.J.MAHASI .....	79
Rapeseed Adaptation Trials in Cyprus. A.HADJICHRISTODOULOU .....	83
The Rapeseed ( <i>Brassica napus</i> L.) Quality Breeding Progress in Shanghai Academy of Agricultural Sciences (SAAS) for Recent Years. SUN CHAOCAI .....	92
Statement on the Execution of the Sino-Canadian Rapeseed Breeding Project in 1988. WANG ZAO MU .....	94
A Preliminary Study on the Combining Ability and Heritability of Main Agronomic Characters in <i>B. juncea</i> . WANG ZAO MU and WANG YAN FEI .....	98
Report on the Execution of Sino-Canada Research Breeding Project. LIU CHENG QUING and HONG HAI PING .....	103

A Review of Orobanche Problem in Nepal. M.L.JAYASWAL .....	106
Oil Crops in Bhutan. TAYAN RAJ GURUNG .....	119
Brassica Production and Research in Pakistan. REHMAT ULLAH KHAN and MASOOD A.RANA .....	127
Summary and Wrap-up for Brassica Sub-Network Meeting. HUGH DOGGETT ..	130
Report on a Tour to Oilseed Brassica Growing Areas of India. GETINET ALEMAW .....	136
Discussions and Recommendations .....	138

## Part 2. Other Oilcrops Subnetwork-I

Safflower Research and Coordination in India. V.RANGA RAO .....	144
Highlights of the Second International Safflower Conference Hyderabad, India from January 9-13, 1989. V.RANGA RAO .....	147
Coordinated Research Efforts and Linseed ( <i>Linum Usitatissimum</i> L.) Improvement in India. MANGALA RAI .....	149
Safflower Research in Eighties in Madhya Pradesh (India). A.R.SAWANT	154
Nigerseed in India: Present Status of Cultivation, Research Achievements and Strategies. S.M.SHARMA .....	159
Constraints and Opportunities for Increasing the Production and Productivity of Niger in India. S.M.SHARMA .....	166
New Potential Areas of Niger in India. S.M.SHARMA .....	169
Present Production, Research and Future Strategy for Niger in Maharashtra. A.V.JOSHI .....	171
Niger in Tribal Bihar. H.B.P.TRIVEDI .....	176
Cultivation and Varietal Improvement of Linseed in India. R.N.DUBEY .	180
Agronomic Management/Agro-Techniques for Improving Production of Niger and Linseed. G.L.MISHRA .....	186
The Present Status of Niger and Linseed Pathology Work in India. G.S.SAHARAN .....	192
Safflower, Niger and Linseed in Nepal. B.MISHRA .....	203
Country Paper on Other Oilcrops in Bangladesh. M.A.KHALEQUE and DILRUBA BEGUM .....	208
Country Report on Linseed and Safflower in Pakistan. MASOOD A.RANA, MOHAMMAD SHARI, and ALTAF H.CHAUDHRY .....	213
Present Status of Safflower in Egypt. BADR A. EL-AHMAR .....	218
Progress in Linseed On-station and On-farm Research in Ethiopia. HIRUY BELAYNEH, NIGUSSIE ALEMAYEHU and GETINET ALEMAW .....	220
Investigations on Some Biochemical Characteristics of Nigerseeds ( <i>Guizotia abyssinica</i> Cass). GETINET ALEMAW and HIRUY BELAYNEH	229
Processing of Oil Seeds in Ethiopia. DEJENE TEZERA .....	233
The Status of Linseed, Safflower and Niger Research and Production in Kenya. T.C.RIUNGU .....	238
Summary and Wrap-up for Other Oilcrops Sub-Network Meeting. HUGH DOGGETT .....	241
Discussions and Recommendations .....	248

### Part 3. Oilcrops Network Steering Committee-I

The Oilcrops Network for East Africa and South Asia, Achievements and Future. ABBAS OMRAN .....	256
Recent Developments in The Oil Crops Network and the ORU. HUGH DOGGETT	265
IBPGR's New Concept for the Conservation and Utilization of Germplasm; Global Crop Networks. J.M.M.ENGELS .....	272
Technology Mission on Oilcrops for Self-Reliance in Vegetable Oils in India. MANGALA RAI .....	274
Oilseeds Research in India: Network, Its Set Up, Organization, Past Achievements and Current Research Thrusts. V.RANGA RAO .....	283
Groundnut and the Oilcrops Network. S.N.NIGAM .....	286
Oilcrops Production in Ethiopia Current Status and Future Prospects. SEME DEBELA .....	288
The Vegetable Oil/Protein System in Kenya Summary Report-Phase I. C.ZULBERTI and J.LUGOGO .....	293
Brassica Sub-Network Achievements and Activities, 1987-88. HIRUY BELAYNEH .....	320
The Present Situation and Main Achievements of Sesame Production in East Africa. MOHAMMED EL-HASSAN AHMED .....	324
Constituion of the Oil Crops Network (Second Draft). MASOOD A.RANA and ABBAS OMRAN .....	330

## NIGER IN TRIBAL BIHAR

H.B.P. Trivedi

Tribal Bihar with a geographical area of 79710 km<sup>2</sup>, comprises plateau, sub-plateau and foot-hills of south Bihar. The area is administratively known as Chotanagpur and Senthal Parganas. This region is largely inhabited 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 (kg/ha)
	('000 ha)	(%)	('000 tons)	(%)	
Madhya Pradesh	224.9	38.47	40.8	28.75	181
Orissa	137.2	23.47	57.6	30.77	420
Maharashtra	101.0	17.27	24.1	18.80	239
Bihar	56.9	9.79	16.9	10.08	269
Karnataka	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

Crops	Area		Production	
	('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 Dotacamund 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 Dotacamund 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 Dotacamund. 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 multilocal 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 gynodioecious. 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.E.m +			96.66	0.10
C.D. 5%			262.40	0.28
C.V. %			20.80	15.32