

**OIL CROPS:  
BRASSICA  
SUBNETWORK**

PROCEEDINGS OF THE  
THIRD WORKSHOP, QUALITY  
TRAINING, AND CHINESE  
PROJECT REPORTS,  
HELD IN SHANGHAI,  
PEOPLE'S REPUBLIC OF CHINA,  
21-24 APRIL 1990

ABBAS OMRAN

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July 1993

# Oil Crops: Brassica Subnetwork

Proceedings of the  
Third Workshop, Quality Training,  
and Chinese Project Reports,  
held in  
Shanghai, People's Republic of China,  
21-24 April 1990



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Organized by  
Ministry of Agriculture, Beijing, China  
and  
International Development Research Centre, Ottawa, Canada

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**ISBN 0-88936-670-5**



**Printed on recycled paper**



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# SOME OF THE CONTRIBUTIONS OF DR. HIRUY BELAYNEH TO OILSEED BRASSICA RESEARCH IN ETHIOPIA

*Getinet Alemaw*

The following are abstracts of papers authored by the late Dr. Hiruy Belayneh, former Chairman of Brassica Subnetwork.

1. Hiruy Belayneh. 1987. Present status and future strategies of oilseed Brassica research in Ethiopia. Proceedings of the first Brassica Subnetwork Workshop held at Uppsala, Sweden, 6-8 May 1987, (A. Omran ed.). IDRC MR 168e: 15-26.

ABS: The primary objective of the oilseed Brassica improvement program is to increase production both for local consumption and export. The research service is also directed towards that end.

The research achievement has been quite rewarding. As a result of the multi-locational testing, five B. carinata and three B. napus varieties have been released. Progress has been made with quality work. The production technology for oilseed Brassica has also been perfected. The economically important diseases and pests have been identified and the control measures are being developed.

Future strategies of oilseed Brassica research are described. There is a great scope for further improvement.

2. Hiruy Belayneh. 1985. The Current Status of Oilseed Brassica Agronomy Research in Ethiopia. CGIRC Bulletin No. 2: 25-27.

ABS: The Ethiopian mustard (Brassica carinata) is grown in Ethiopia only on a small scale, mainly in fertile, well drained fields often close to house. Contrarily, a sizeable area of B. napus varieties is cultivated on state farms. A number of trials on cultural practices were carried out at Holetta and cooperating stations. Seed yield was generally more influenced by the date of sowing and by NP fertilization than by differences in plant population. Higher yields for both the species were obtained when planted at the onset of main rains, expected in mid-June at most sites. Fertilizer (46/69 kg/ha of N/P<sub>2</sub>O<sub>5</sub>) significantly increased seed yield at several locations. A seed rate of 6-10 kg/ha was found optimal depending upon the location and weather conditions. Cropping sequence studies at Holetta showed that wheat or barley following rapeseed

produced good seed yields.

3. Hiruy Belayneh. 1985. Review of Rapeseed/Mustard Breeding and Agronomy Research in Ethiopia. Review of Field Crop Research in Ethiopia. IAR.

ABS: Ethiopian mustard (Brassica carinata) is grown traditionally by Ethiopian farmers as both an oilseed and vegetable crop, while Argentine rapeseed (B. napus) and Turnip rapeseed (B. campestris) were introduced into Ethiopia about 13 years ago.

Coordinated research on oilseed Brassica improvement in Ethiopia started in early 1970's and the research work has progressed through several phases since then, resulting in the release of five B. carinata (S-67, S-71, S-115, Awassa population and Dodolla-1) and three B. napus (Target, Pura and Tower) varieties. Pura and Tower have low erucic acid and low glucosinolate levels. Seed yields of B. carinata approached 4800 kg/ha under ideal conditions where the grain-filling period was prolonged. At sites where maturity was accelerated, yields of B. carinata and B. napus were similar. A breeding program is expected to produce mustard varieties low in both erucic acid and glucosinolate contents in a few years.

4. Hiruy Belayneh, K.W. Riley, Nigatu Tadesse and Getinet Alemaw. 1983. The responses of three Oilseed Brassica species to Different Planting dates and Seed rates in the highlands of Ethiopia. Eth. J. Agric. Sci. 5 (1): 22-31.

ABS: Brassica carinata is grown traditionally by Ethiopian farmers as both an oilseed and vegetable crop, while B. campestris and B. napus were introduced about 10 years ago. The performance of B. carinata (S-67), B. napus (Target), and B. campestris (Torch) cultivars was evaluated at a number of locations in Ethiopia 2000 m above sea level.

See yield of S-67 (B. carinata) approached 3500 kg/ha under ideal conditions, where the grain-filling period was prolonged. At sites where maturity was accelerated

yields of S-67 and Target were similar. Yields of Torch (*B. campestris*) were low at all sites. Highest yields for all cultivars were obtained when planted at the onset of the main rains, expected in mid-June at most sites. A seed rate from 6-10 kg/ha was found to be optimal, depending on the season and location. Mean oil content of Target (*B. napus*) was 45%, while both S-67 and Torch average 40% at Holetta in 1981. Mean 1000 seed weight of S-67 was equal to or slightly greater than that of Target, and much greater than that of Torch.

Cultivars of both *B. carinata* and *B. napus* can produce good yield in the highlands of Ethiopia, but under long-growing-season conditions, *B. carinata* may have an advantage. Experimental lines of *B. carinata* which are earlier and have oil contents equal to those of *B. napus* have been identified and are being tested.

5. Hiruy Belayneh and Nigussie Alemayehu. 1986. Progress in rapeseed/Mustard Research in Ethiopia. Proceeding of 3rd Oilcrop Network Workshop held in Ethiopia 6-10 October. A. Omran (ed.). IDRC. MR 153e: 12-18.

ABS: Ethiopian mustard (*Brassica carinata*) has been grown by Ethiopian farmers as both an oilseed and vegetable crop for thousands of years, while the Argentine rapeseed (*B. napus*) is a recent introduction and is widely grown on state farms.

Since the beginning of coordinated research in oilseed Brassica in the early 1970's, more than one thousand collections of the two species were evaluated. The research endeavor resulted in the release of five high yielding *B. carinata* and four *B. napus* varieties. There is a crossing program now in progress involving high yielding *carinata* and the introduced *B. napus* and *B. juncea* varieties with low erucic and glucosinolate levels to achieve *B. carinata* cultivars which are both high yielders and low in erucic and glucosinolate contents.

Results of the trials on sowing date, seed rate and fertilizer levels are discussed. Studies on the control of weeds are also reviewed. The on-farm trials showed the possibility of increasing yields when the oilseed Brassica growers follow the recommendation.

Seven diseases and 13 insect pests have been reported on rapeseed and mustard. However, most are minor to date.

6. Hiruy Belayneh, Getinet Alemaw and Nigussie Alemayehu. 1989. Yellow Dodolla-Ethiopian Mustard. Oilcrops Newsletter 6: 58-59.

ABS: Dodolla was collected on land race from a place called Dodolla in Bale region. It was in various states from 1974-79. In 1980 it was released as a mixture of yellow and brown seeds, latter mass selection for yellow seed was initiated and resulted in a new variety "yellow Dodolla" in 1988. Yellow Dodolla is higher in oil and protein and low crude fibre than its parent population.

7. Hiruy Belayneh and Nigussie Alemayehu. 1987. Comparative

Performance of Ethiopian mustard (*B. carinata* A. Braun) and Argentine rapeseed (*B. napus* L.) Under Improved and Traditional Farming practices. Proceedings of 7th International Rapeseed Congress held in Poland, May 1987: 1044-49.

ABS: The on-station research work in the past several years has identified improved Ethiopian mustard and Argentine rapeseed varieties. The basic agronomic information was made available at the same time as the new cultivars were released. This package testing was undertaken to acquaint the users with new innovations and appreciate their preference.

The performance of *Brassica carinata* and *Brassica napus* varieties was tested for two seasons at four sites under both improved management practices developed on the research centres, and traditional farming practices. The Late *B. carinata* entries were able to use the longer growing season in the highlands of Ethiopia and yielded much better than the earlier maturing *B. napus* types. The researchers' package resulted in substantial seed yield increase. Variety and fertilizer were the two most important factors for higher seed yields. Among the varieties tested, S-67 performed best across site under both management practices. *B. napus* was more responsive to better management.

8. Getinet Alemaw and Hiruy Belayneh. 1990. Influence of seed coat color on seed weight, oil, protein and crude fibre content of *Brassica carinata* A. Braun. Proceedings of the 3rd Brassica Subnetwork Workshop held at Shanghai, China on 23 April. (A. Omran ed.) IDRC Manuscript Reports (under publication).

ABS: The influence of seed coat color on seed weight, oil content of the whole seed as well as protein and crude fibre contents of the meal of *B. carinata* was studied using 11 accessions and one cultivar for two seasons at Holetta. The mean seed weight, oil, protein and crude fibre contents were 4.6 g, 41.6%, 32.2% and 12.3%, respectively. Yellow seeded lines produced heavier seed weight (0.6 g), higher oil (3.2%), and protein (3.1%) contents than brown seeded lines from similar genetic background. The crude fibre content of the meal from yellow seed was lower than that of the meal from brown seeds by 3.1%. This relationship suggested that the alleles controlling seed coat color in *B. carinata* exhibit pleiotropic effects on seed quality traits. The study demonstrated that selection for yellow seed coat color could result in higher oil and improved meal quality in *B. carinata*.

9. Getinet Alemaw and Hiruy Belayneh. 1988. Influence of seed coat color on seed quality in "Gomenzer" (*Brassica carinata*). SEBIL 1(1):20.

ABS: Yellow and brown seeded sublines from similar backgrounds were planted at Holetta in split-plot. Yellow seeded sublines showed more oil and heavier seed weight than their non-yellow counter parts. In

similar studies with *B. campestris*, it has been shown yellow seeded sublines had a thinner seed coat. Yellow seed coat color has also been associated with increase in proportion of the embryo to the total seed weight resulting in higher oil, higher protein and less crude fibre than their brown seeded isogenic lines. A similar relationship appears to occur in gomenzer.

This relationship suggests that the alleles affecting seed coat color also exhibit pleiotropic effects on seed quality. In brown seeded gomenzer cv. S-67 the seed color was controlled by a single gene pair with brown being incomplete dominance over yellow. The homozygous recessive condition resulted in yellow seed.

10. Getinet Alemaw and Hiruy Belayneh. 1989. Variation of Alkenyl Glucosinolates in "Gomenzer" (*Brassica Carinata* A. Braun). SEBIL 2 (No. 1 and 2): 7.

ABS: "Gomenzer" germplasm was screened for glucosinolate pattern and content. Allylglucosinolate contributed about 90% of the total amount. Cultivars S-67 and Yellow Dodolla contained 164 and 150 micro-moles of glucosinolate per gram of defatted dry meal,

respectively. Two populations, PGRC/E 208531 and 208539, showed reduced levels. As a result of plant-to-row selections out of these populations, low glucosinolate lines were identified.

11. A. Haile, E. Zerfu and H. Belayneh. 1988. Performance of Local and Improved mustard (*B. carinata* A.Br.) and linseed (*Linum usitatissimum* L.) cultivars under improved and traditional farming practices. J. Crop Research. 1: 43-49.

ABS: Local and improved cultivars of mustard and linseed were grown for two growing seasons, 1986 and 1987 in the Central and North Western zones at two levels of management, improved and traditional. The improved linseed varieties (CI 1525 and CI 1652) and mustard selection (S-67) recorded very high yields over the years. Across locations, the local and improved varieties of both crops gave higher yields where the improved technologies were properly implemented as compared to the traditionally managed fields. Hence, management is critical in mustard and linseed production areas. The marginal rate of returns were 29.4 and 139.1 (birr/q) for the Agricultural Market Corporation and local prices, respectively.

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