EVALUATION OF SOME ETHIOPIAN MUSTARD /BRASSICA CARINATA/ GENOTYPES UNDER INDIAN CONDITIONS

K.S.Labana, K.L.Ahuja, S.S.Banga

Department of Plant Breeding
Punjab Agricultural University, Ludhiana, India

Abstract

This communication reports the performance of thirty-nine collections of Ethiopian mustard obtained from various American, European and Indian sources. Lot of variability was observed for different agronomic traits. Variability was low for plant height and maturity duration with most of genotypes showing tall plant habit and delayed maturity. Branch number had maximum variability. It ranged from 46 per cent in Karak to 80 per cent in PC-5 a local collection. Not much variability was recorded for oil content as most of the varieties clustered around 35 per cent mark. Ethiopian introduction, Karak had the best fatty acid composition with lower amount of undesirable erucic acid /35 per cent/ and highest amount of desirable oleic and linoleic acids i.e. 16.3 and 21.7 per cent respectively.

Introduction

India is one of the largest oilseed producer in the world and is next only to U.S.A., China and Brazil.In spite of a large agricultural base, India has emerged as a single largest importer of oilseeds.

Unless the problem is tackled on war footing, the supply/demand gap is likely to further widen to 3.6 million tonnes by 2000 A.D. from present gap of 1.42 million tonnes. Brassica oilseed group offers the best potential to bridge this gap. Indian mustard /Brassica juncea/ and Indian rape /B.campestris/ have the widest distribution in the country. Of late, another Brassica species i.e. B.napus is becoming popular with the farmers in the

states of Punjab, Haryana and Rajasthan. Constant cultivation over centuries has led to the development of disease and pest complexes associated with these crops. Recently, Alternaria blight and white rust have appeared in epidemic forms. Thus there is a need to diversity not only the type of varieties grown but even the species or genera. Exotic types have different evolutionary history and thus are expected to offer a degree of resistance to prevalent disease-pest syndrome. The first step towards diversification is identification of species with maximum potential. Amongst oil bearing Brassica's only Ethiopian mustard /B.carinata A. Br./ is not under substantial cultivation in India. The most promising source of this species is Ethiopia. In this communication we are focussing the potential of this species as a winter crop.

Material and methods

Thirty nine collections of Ethiopian mustard were evaluated of which 17 entries were obtained from various American and European sources by S.S.Banga. In addition, three entries were collected from farmer's fields and the rest was taken from various Indian sources. The germplasm collection was evaluated in a randomized complete block design with three replications over two years i.e.1984-85 and 1985-86.

The oil content was estimated by NMR /New Port Analyser, Model MK 111A/. Identification and quantification of various fatty acids were done as described by Batta et al. /1985/.

Results and discussion

Adaptation of a new species or varietal strains to an alien environment requires two types of changes, namely the modification of environment and the modification of heredity. The modification of environment involves the adjustments in terms of agronomic inputs. After identifying the most optimum agronomic environment, the next step is the genetic modification through classical breeding

techniques like hybridization and selection of propituous genotypes. However, the evaluation of an introduction is a logical pre-requisite to its exploitation. Almost without any exception the breeding goal of any Brassica oilseed crop was higher yield, increased oil content, lower levels of long chain fatty acids and linolenic acid, higher level of saturated and essential fatty acids. In B.carinata, maximum variability was observed for secondary branch number followed by primary branch number /Table 1/. Variability was very low for plant height and maturity duration, as most of the genotypes evaluated during the study were tall growing and late in maturity. BX 2-1, a Spanish collection had the shortest plant height. Variety BCRIDA 3 from IARI, New Delhi had the longest pods /5.3 cm/. Ethiopian collection, Tomu had the maximum pod intensity on the main shoot. Variety BCRIDA 3 was the highest yielding.

An interesting finding of this study is variation for self seed setting. The lowest percentage of self seed setting was observed in Karak /46%/ and the maximum /88%/ in a farmers' field collection from Rajasthan /PC-5/. This indicated that there is a variability for self incompatibility. This is significant as this Brassica amphiploid is known to be self compatible.

After yield and its components, the next most important objective is oil content and quality. Not much variability was available for oil content as most of the varieties clustered around 35 per cent mark. Not much variability was observed for individual fatty acids /Table 2/. Ethiopian collection, Karak appeared to have the best fatty acid composition. It had the lowest amounts of undesirable erucic acid /34.7%/ and linolenic + ecosenoic acid /21%/ and the highest amounts of desirable oleic and linoleic acids i.e. 16.3 per cent and 21.7 per cent respectively. Oil content was not correlated with any individual fatty acid, while palmitic acid was correlated with oleic acid.

The variability for various qualitative and quantitative traits as recorded in this study underlined the possibility for further improvements. Breeding thrust must be directed towards developing high yielding and short statured genotypes especially for sowing under rainfed conditions. A serious shortcoming of this oil crop is low oil content, which must be improved to make this crop a successful competitor for Indian mustard.

References

Batta S.K., Ahuja K.L., Raheja R.K., Labana K.S., 1985. Variability in oil content and fatty acid composition in linseed /Linum usitatissimum L./. Annals of Biology. 1 /1/, 80-85.

Table 1. Variation for different quantitative traits in B. carinata

Character	Range		Mean	Coefficient of variability /%/
	Minimum	Maximum		
Maturity (days)	160.0 (EC-2)	215.0(HC 5)	187.5	10.5
Plant height (cm)	132.0 (B x 2-1)	274.0 (May 82)	187.68	18.3
Pmy. branch No.	7.0 (B x 2-1)	36.0 (PI 360 882)	12.51	57.7
Secondary branch No.	5.0 (B x 2-1)	143.0 (PI 360882)	33.7	97.7
Pod length	4.1 (HC-1)	5.3 (BCRIDA 3)	4.3	30.1
Pod intensity (%)	67.2 (B x 2-1)	100.0(EC 2)	73.2	15.7
Seed yield per plant (gm)	3.2 (EC 5)	13.7 (BCRIDA 3)	7.5	16.5
Oil content (%)	27 (EC5)	37 (May 82)	35.0	34.0

Table 2. Fatty acid composition of the germplasm collection of *B. carinata*

Fatty acid	Range		Mean	Coefficient of variation /%/
	Min.	Max.		
Palmitic	3.7 (May 82)	5.1 (Karak)	4.3	11.6
Oleic	10.7 (May 82)	16.3 (Karak)	14.5	13.7
Linoleic	14.8 (PC-1)	21.7 (Karak)	17.8	12.0
Linolenic+ Eicosenoic	21.0 (Karak)	25.9 (PC-1)	23.0	8.9
Erucic	34.7 (Karak)	47.3 (PC-2)	41.8	9.0