Participatory On-farm Evaluation of Ethiopian Mustard
(*Brassica carinata* A. Braun) Varieties in Ethiopia

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Abstract

This paper summarizes the results of on-farm evaluation of Ethiopian mustard varieties grown under farmers' conditions at two locations in Ethiopia. The study was made to test and identify varieties that can fit to the needs and circumstances of different target groups in a participatory manner for two years using nine advanced lines from the breeding program and farmer's own cultivar as a local check. Seven of the tested varieties gave seed yield advantages ranging from 5% - 18% over the local check. The entry PGRC/E 21237 gave the highest yield (2324 kg/ha) followed by PGRC/E 21223 (2271 kg/ha) while the local check gave the third lowest yield (1977 kg/ha). Farmers evaluated the varieties using their own pre-and post-harvest evaluation criteria. Leaf cookability (for food purpose) was the most important pre-harvest criterion they considered whereby the standard check "Yellow Dodolla" incidentally stood as the top ranking variety in this regard. They also gave weight for each of the post-harvest criteria: seed colour, seed yield, marketability, seed weight, seed filling in the same order of importance. With respect to all the criteria set, PGRC/E 21237 was ranked to be the first most preferred variety followed by "Yellow Dodolla" and PGRC/E 21223. Local oil millers on the other hand, insisted that "Yellow Dodolla" is their first choice for having higher oil content. The study has generally established that mustard varieties with best agronomic performance are not necessarily of high farmer's choice and also that ranking of varieties differs with target groups; but plant breeding is always left with the challenge of satisfying all.

Introduction

The importance of on-farm evaluation of a new variety or technology under real farmers' growing conditions, attitudes, constraints, and related socio-economic factors, supported by agronomic interpretation help in formulating recommendations relevant to small-scale farmers (CIMMYT, 1988; Lancon *et al.*, 1989).

Stronger participation by farmers in agricultural research and extension processes is increasingly improving that helps realise the socio-economic and natural circumstances of small-scale farmers, which are complex, diverse and risk-prone (Knipscheer et al., 1989). Such a strong participatory research partnership from problem diagnosis to fine-tuning of recommendations plays several critical roles for a successful technology generation and transfer (Collion, 1991).

In Ethiopia, *B. carinata* is mostly grown at a subsistence level by traditional farmers and the decisive factors considered by researchers, farmers and oil extractors to judge the merits of varieties often vary. The objective of the study was, therefore, to test and identify useful varieties that can fit into the farmers' conditions and perceptions and also to formulate selection criteria that will satisfy the needs of the target groups in the test areas.

Research Methodology

The on-farm experiment was undertaken at two locations (Meta-Robi and Guder) and years (1999-2000) in Ethiopia in a manner of participatory research whereby researchers, farmers, oil extractors and NGOs were involved during the whole processes of problem identification, prioritisation, implementation and evaluation. Four willing farmers were selected at each location to test seven advanced lines of Ethiopian

mustard against two standard (Yellow Dodolla and S-67) checks and one farmers' own cultivar as a local check. A seed rate of 15 kg/ha and fertilizer rate of 46/69 N/P$_2$O$_5$ Kg ha^{-1} were the only inputs of improved packages used by the farmers. The trial was conducted on a gross plot size of 36m^2 (6m x 6m) and a net plot size of 16 m^2 (4m x 4m) with two reps at each location and year.

The evaluation criteria considered by the farmers were cooking time, taste, acceptance for culinary purpose, chew-ability, color after cooking, yield, grain filling, grain weight, grain color, marketability and grain size; while yield and oil content were the major criteria of selection by the researcher. Grain size and weight, shininess, and purity were termed in aggregate as "attractiveness" by oil extractors to judge varieties.

Since the importance of one criterion was different from another, a weight was assigned for each criterion using pair-wise matrix ranking method. Direct matrix ranking technique was used to prioritise the different varieties with respect to a single evaluation criterion and weighted matrix ranking method was used to prioritise varieties with respect to overall criteria.

Results and Discussion

Agronomic evaluations

Table 1 shows that the highest yield (2324 kg/ha) was obtained from PGRC/E 21237 followed by PGRC/E 21223 (2271 kg/ha) and PGRC/E 21156 (2228 kg/ha). The lowest mean yield (1933 kg/ha) was obtained from PGRC/E 21170 and the local check was the third lowest seed yielder. In general, six of the candidate materials surpassed the best check in yield but none did so in oil content. Although the first two high yielding candidates exhibited considerably low level of oil content as compared to the best check, this has been offset by having the capacity to produce more oil yield per unit area and thus these two varieties were identified by the breeder to be commendable.

Table1. Agronomic performance of Ethiopian mustard varieties evaluated under on-farm conditions at Meta-Robi and Guder, Ethiopia during 1999-2000

Agronomic performance	Variety											Mean	LSD5%	CV(%)
	PGRC/E 21156	PGRC/E2 21162	PGRC/E 21163	PGRC/E 21170	PGRC/E 21223	PGRC/E 21237	PGRC/E 21263	Yellow Dodolla	S-67	Local Check				
Yield	2228	2197	2193	1933	2271	2324	2137	2075	1918	1977	2125	327	31.3
Oil c.	35.2	36.2	35.0	35.4	34.9	35.4	35.9	38.6	35.6	32.2	35.4		
Oil y.	855	867	835	813	879	914	749	866	788	770	834		
% Incr. (seed y)	12.69	11.13	10.93	-	14.87	18.00	8.10	5.00	-	-			

Oil c. = Oil content; Oil y. = Oil yield; %Incr.(seed y.) = Percent increase (seed yield) over the local check

Preference evaluations by farmers

Results of evaluations of the varieties based on the pre- and post-harvest selection criteria set by farmers are given in Tables 2 and 3. Among the five criteria set for pre-harvest prioritisation, cooking time was of prime importance followed by the value of satiety. The standard check "Yellow Dodolla" incidentally stood as the top ranking variety in this regard followed by the second check, S-67. The two high-yielding candidates of the breeder's choices on the other hand appeared as less (PGRC/E 21223) or least (PGRC/E 21237) preferred. Based on the post-harvest selection criteria, however, farmers' choices have concurred at least partly with that of the researcher in that the highest-yielding variety PGRC/E 21223 turned out also as the most preferred one by the farmers. This is not surprising since most of the post-harvest selection criteria set by the farmers are only components of yield, which was main factor of decision making for the breeder. Based on these criteria also the standard check, "Yellow Dodolla" once again appeared the second most preferred variety followed by the other check, S-67, which was agronomically one of the least-performing varieties.

Table 2. Weighted matrix ranking of the pre-harvest selection criteria and the performance rank of the mustard varieties evaluated under on-farm conditions at Meta-Robi and Guder, Ethiopia during 1999-2000

Evaluation criteria	Weight	PGRC/E 211156	PGRC/E 21162	PGRC/E 21163	PGRC/E 21170	PGRC/E 21223	PGRC/E 21237	PGRC/E 21263	Yellow Dodolla	S-67	Local check
Ac.for cu.purpose	3	6	6	3	6	9	3	6	3	6	9
Cooking time	1	3	3	2	5	4	3	4	1	1	5
Taste	2	4	4	4	4	4	4	4	2	2	4
Chewability	5	5	5	10	10	10	10	10	5	5	10
Color after cooking.	4	12	8	8	12	12	8	12	4	4	10
Score		30	26	27	37	39	28	36	15	18	38
Rank[1]		6	3	4	8	10	5	7	1	2	9

[1] is for best preference; Ac. for cu. purpose = Acceptance for culinary purpose

Table 3. Weighted matrix ranking of the post-harvest selection criteria and the performance rank of the mustard varieties evaluated under on-farm conditions at Meta-Robi and Guder, Ethiopia during 1999-2000

Evaluation criteria	Weight	PGRC/E 211156	PGRC/E 21162	PGRC/E 21163	PGRC/E 21170	PGRC/E 21223	PGRC/E 21237	PGRC/E 21263	Yellow Dodolla	S-67	Local check
Marketability	1	3	3	2	4	5	1	3	1	4	5
Grain color	2	4	4	2	6	4	4	4	2	4	6
Grain filling	6	12	12	12	12	12	6	18	6	6	12
Yield	3	3	6	6	6	3	3	6	3	3	6
Grain size	5	10	15	5	10	15	5	20	10	5	10
Grain weight	4	12	8	8	16	12	4	12	4	8	8
Score		44	48	35	54	51	23	63	26	30	47
Rank[1]		5	7	4	9	8	1	10	2	3	6

[1] is for best preference

Performance evaluations by oil extractors

According to the criteria set by this group of clients, the variety, "Yellow Dodolla" was ranked as first while PGRC/E 21170 turned out to be the least attractive for oil extraction.

Conclusions

The results have convincingly indicated that there are differences among the various stakeholders in criteria of selection and the mustard varieties thereof. Varieties with high- seed and/or oil yielding capacity may not necessarily be of high choice by small farmers or oil mills leaving the breeder at a crossroad.

References

CIMMYT. 1988. From agronomic data to farmer recommendations: An economics training manual. Completely revised edition. 06600 Mexico, DF: CIMMYT. 84 pp.

Collion, M. 1991. An approach to long-term program design. ISNAR Working Paper No 37. ISNAR, The Huge.

Knipscheer, H.C. and R.R. Harwood. 1989. On-station versus on-farm research: allocation of resources. **In**: S. Sukmana, P. Amir and D.M. Mulyadi (eds), Developments in procedures for farming systems research proceedings of an international workshop 13-17 March 1989. Puncak, Bogor, Indonesia. Agency for Agricultural Research and Development, Jakarta.

Lancon J., Chanselme J.L., and Klasson C. 1989. Representativeness of varietal trials carried out under controlled and real conditions in the north Cameroon cotton zone. Cotton and Fibres of Tropics 44: 118-125.