Review of Rapeseed/Mustard Agronomy Research in Ethiopia

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INTRODUCTION

Ethiopian mustard *(Brassica carinata)* is grown traditionally by Ethiopian farmers as both an oilseed and a vegetable crop. The use of the crop reported by farmer includes : – crushed and dried seed for greasing the metad before injera (local bread) is baked ; the leaves are boiled as stew (goman wat) ; the seed crushed and oil extracted by stirring ; seed is used as component in spice ; to make soup and to soften leather. This species is grown in the mid and high altitudes (1650 to 2600 m) areas on more fertile well drained soil often close to houses. The other two species currently under investigation *(B. napis* and *B. campestris)* were introduced into Ethiopia about 14 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* and three *B. napus* varieties. The cultural practices were also studied at several sites and the optimum package for certain locations was established. A brief account of the agronomy results obtained follows.

LINES OF INVESTIGATION

Different agronomic parameters like sowing date, seed rate, fertilizer level and cropping sequence were studied so as to establish the management practice necessary for optimal rapeseed/mustard production.

RESULTS AND PROGRESS

The research results on agronomic aspects have been categorized under different headings as follows :

a) Sowing Date :

Sowing date is one of the most important factors affecting the seed yield of mustard and rapeseed. In the Brassica cultural practice trials conducted between 1970 and 1983 at five sites, it was found that highest seed yields for the different species have usually been obtained when planted at the onset o the main rains. In high altitude, cool areas such a Bekoji, highest yields were obtained by planting a the end of May (Table 1). Dry planting at Holetta up to two weeks before the rain started, did no affect seed yields. On the other hand, seeding delaye after the start of the main rains resulted in lowe seed yields. The late planted crop was more suscep tible to the attack of aphids. The optimum time o sowing for different oil crops growing areas is give in Table 1 and Figure 1A.

b) Planting Technique :

Fourteen years (1970-83) mean seed yiel results for different seed rates are given in Table 2 In general, the mean seed yields were not greatl affected by seeding rates from 6 to 15 kg/ha However, the 10 kg/ha rate had a slight advantage a several sites. At Holetta in 1982, where stress wa encountered, the lowest rate (6 kg/ha) resulted in th highest seed yield (Fig. 1C). In areas (soils) havin high nitrogen and available phosphorus, higher see rates usually caused plants to grow tall and lan which resulted in lodging. Hence a seed rate fro 6 to 10 kg/ha was found to be optimal dependin on the weather condition and location.

Good yields can be obtained by broadcastin (Tables 2 & 3), but row planting may be preferabl so that cultivation between the rows can be carrie out. When row planted, the seed should be drille with distance between rows of 30-50 cm. Result from Kulumsa and Awassa indicate that a row spa cing between 20 and 80 cm has little or no effect o seed yield (Table 3).

c) Nutritional Requirement :

Mustard cultivars are seldom fertilized at farmer field. However, the crop is grown mainly by smal farmers, in more fertile, well drained areas, ofte close to their houses. It has been established tha rapeseed and mustard are heavy users of both nitro gen and phosphorus.

The effect of NP on seed yield was studied at oletta (1970-72) and Kulumsa (1980-82). The seed ield results are shown in Tables 4, 5 and 6. The ata from Holetta revealed that rapeseed/mustard is ıore sensitive to phosphorus than nitrogen level n both red and black soil (Table 4). The crop ıowed a very low response to nitrogen while the esponse to phosphorus was very high. On the other and, the results of three years investigation on itrogen, phosphorus and potassium fertilizer levels t Kulumsa did not show any marked yield response Tables 5 and 6).

Multilocation variety trials grown both with and ithout fertilizer showed that the application of 6/69 kg/ha of N and P_2O_5 at Bekoji, Holetta, Robe Arsi), Shambu, Burie, Mota, etc. produced much ıigher seed yields compared with the seed yields ıf unfertilized trials. On the other hand, both rape-eed and mustard were less responsive to fertilizer t Kulumsa, Awassa, Sheneka, Geredella, etc. The oils of the later sites have high N and available P ontent (Tables 7-9).

Soil testing must be done to assess the fertility tatus and the fetilizer dose must be decided accord-ngly. In soils very low in N and P, seed yield can be ncreased substantially by the application of the ecommended rate worked out which is 46/69 kg/ha of N and P_2O_5.

d) Cropping Sequence :

At Holetta, croppung sequence studied showed hat wheat, barley or teff following rapeseed pro-duced good yields. However, rapeseed following apeseed produced low yields. Hence land seeded to apeseed or mustard should not be seeded to *Brassica* pecies (or sunflower) again for at least two years. The interval is required to break the cycle of pests and diseases.

SUMMARY AND RECOMMENDATIONS

The research work has identified some improved cultural practices for the released varieties of rapeseed and mustard. Seeding time has profound effect on the production of mustard and rapeseed. Timely sowing must be ensured to get maximum returns from applied input. First fortnight of June or even third week of June is the proper sowing time. Late sowing causes considerable reduction in yield.

Maintainance of optimum plant population is essential for getting good harvest. The spacing and seed rate recommended for row planting are 30 cm and 10 kg/ha, respectively. The recommendation may be slightly adjusted according to the species, soil type and weather condition prevalent at time of sowing.

Rapeseed/mustard respond well to nitrogen and phosphorus. However, soil testing must be done to assess the fertility status and fertilizer dose must be decided accordingly. In soils very low in nitrogen and available phosphorus, seed yield can be increased substantially by the application of the recommended rate worked out which is 46/69 kg/ha of N and P_2O_5.

The rapeseed-mustard crops have been found to be excellent precursors for wheat and barley and should be grown in rotation.

It is very important to correctly determine the right time of harvest. Harvest the crop when most of the pods are matured. Rapeseed and mustard can be swathed when the seeds contain 35 and 25 % moisture, respectively. When the seed in the swath has reached 10 % moisture, or produces a hard, crushing sound when bitten with the teeth, the crop can be combined.

Table 1 – Brassica sowing date trial, 1970-83
(Mean Seed Yield in kg/ha)

Location	Holetta		Bekoji	Kulumsa	Awassa	Robe
Year Sowing date	1970-72	1981-83	1971-72	1981-83	1970-73	1982-83
Late - May	–	–	4830	–	–	–
Early - June	–	1940	3630	–	–	–
Mid - June	2160	1902	3680	1961	2470	–
Late - June	2388	1867	2545	1979	1205	2515
Early - July	1807	1620	–	1771	1313	2850
Mid - July	1548	–	1920	–	1180	2521
Late - July	–	–	–	–	856	2045
Mean	1976	1832	3321	1904	1405	2482

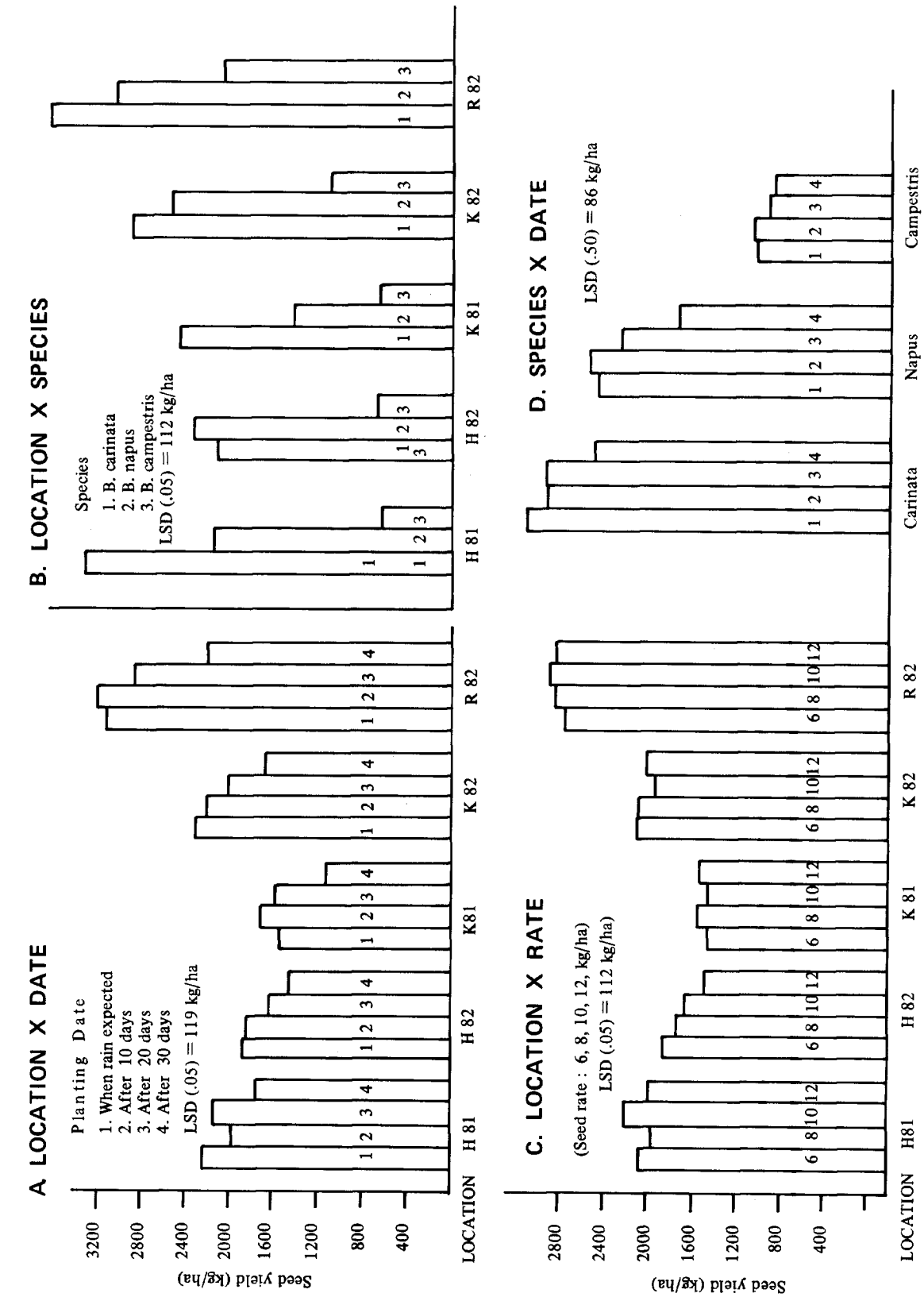

Figure 1 – Interactions between locations, planting, dates, and seed rates on grain yield of three Brassica. Species, locations H : Holetta - K : Kulumsa - R : Robe

Table 2 – Brassica seed rate trial, 1971-83
(Mean Seed Yield in kg/ha)

	Broadcast			Drilled		
	Holetta	Kulumsa	Holetta	Kulumsa		Robe
	1971-72	1971-72	1981-83	1971-72	1981-83	1982-83
5	2275	2800	–	2510	–	–
6	–	–	1872	–	1940	2458
8	–	–	1853	2350	1902	2478
10	2519	2850	1884	–	1831	2533
12	–	–	1718	–	1866	2460
15	2408	2715	–	2637	–	–
Mean	2401	2788	1832	2499	1885	2482

Table 3 – Effect of Spacing in Mustard at Kulumsa and Awassa
(Seed Yield, kg/ha)

Location & Year	Row Spacing (cm)					
	80	75	50	40	20	Broadcast
Kulumsa 1971		2300	2280		2360	2440
" 1972		2330	2600		2450	3140
Awassa 1971	1480			1400		

Table 4 – Rapeseed fertilizer level trial – Holetta 1970-72
(Mean Seed Yield in kg/ha)

P_2O_5 kg/ha	N fertilizer kg/ha										Mean
	0		30		60		90		Mean		
	Red*	Black	Red	Black	Red	Black	Red	Black	Red	Black	
0	1025	234	993	228	789	190	740	249	887	241	564
30	1642	829	1896	928	2043	896	2003	1222	1896	968	1432
60	1749	896	2271	1098	2759	1279	2809	1467	2397	1185	1791
90	1813	790	2015	1177	2555	1464	2410	1727	2198	1290	1744
Mean	1557	687	1793	873	2037	957	1990	1166	1845	921	1383
	1122		1333		1497		1578		1383		

* Soil type.

Table 5 – Rapeseed Fertilizer Level Trial, Kulumsa 1980-83
(Mean Seed Yield in kg/ha)

P_2O_5 kg/ha	N fertilizer kg/ha					Mean
	0	23	46	69	92	
0	1433	1783	1652	1640	1943	1690
10	1607	1690	1958	1901	2009	1833
20	1908	1887	2064	2174	2035	2014
30	1835	1928	1714	2061	2238	1955
40	1737	1969	2241	2365	2404	2143
Mean	1704	1852	1926	2028	2126	1927

Table 6 – Effect of K Fertilization on the Yield of Rapeseed, Kulumsa 1980/82
(Seed Yield in kg/ha)

N-P kg/ha	Potassium kg/ha											
	0			33			50			66		
	1980*	1981	1982	1980	1981	1982	1980	1981	1982	1980	1981	1982
0 - 0	2460	560	1010	2680		1628		600		2620		1846
23 - 20			1441			1686						1566
46 - 20	3410	1240		2820						3650		
46 - 30			1773			1637						1846
60 - 30	3220			2970						3170		
69 - 20								1140				
69 - 30		1240						1230				
Mean	3030	1013	1403	2823		1650		990		3147		1752

* Year planted.

Table 7 – Mean Seed Yield in kg/ha of Rapeseed Varieties in the NYT Grown with 46/69 kg/ha of N/P_2O_5 (F_1) or without (F_0)

Location	1981*		1982		1983		1984		Soil analysis		
	F_0	F_1	F_0	F_1	F_0	F_1	F_0	F_1	PH in H_2O	N (%)	P_2O_5 (PPM)
Holetta	437	1974	602	2379	558	1764	1521	2363	5.04	0.30	19.66
Bekaji			103	2092	297	3109	211	2657	5.08	0.27	4.58
Fumulse			2443	2604	398	586	371	1093	5.68	0.18	64.41
Awassa			1592	1833	1081	1224	935	1140	4.78	0.16	306.30
Alamaya			1712	1484	1643	2682					
Detre Zeit			2319	2727	764	1366	1471	1261	6.88	6.13	62.12
Robe			599	1888					5.30	0.36	86.40
Mean	437	1974	1339	2144	790	1789	902	1769			

* Year planted.

Table 8 – Mean Seed Yield in kg/ha of Rapeseed Varieties in the EYT Grown with 46/69 kg/ha of N/P_2O_5 (F_1) or without (F_0)

Location	1982*		1983		1984		Soil analysis		
	F_1	F_0	F_1	F_0	F_1	F_0	PH in H_2S	N (%)	P_2O_5 (PPM)
Debra Taber	2758	1819	1979	1174	2567	2207	4.85	0.19	76.64
Burie	1877	125	404	37	1364	183	5.16	0.14	12.00
Robe	2412	1182	1440	1288	383	222	6.63	0.18	16.62
Mota	1524	160	1246	0	1016	115	4.85	0.16	6.48
Shambu	3121	171	2211	81	1392		6.00	0.20	21.34
Shenka	2617	3172							
Geradella	873	623							
Adelle	2913	2518	4081	2417					
Herero			1979	1174					
Diksis	1315	1295							
Mean	2157	1229	1906	882	1344	559			

* Year planted.

Table 9 – Mean Seed Yield in kg/ha of Mustard Varieties in the EYT Grown with 46/69 kg/ha of N/P_2O_5 (F_1) or without (F_0)

Location	1982*		1983		1984		Soil analysis		
	F_1	F_0	F_1	F_0	F_1	F_0	PH in H_2S	N (%)	P_2O_5 (PPM)
Debre Taber	2454	1910	2012	1918	3347	2879	4.85	0.19	76.64
Shambu	2925	623	1631	52	1583	45	5.00	0.20	21.34
Robe	2767	2143	2119	1271	675	400	6.63	0.16	16.62
Burie	1633	686	1336	0	1196	265	5.18	0.14	12.60
Mota	1448	487	797	0	1032	55	4.85	0.16	6.48
Adella	1781	1642	2358	1638					
Geradella	1138	1007							
Diksis	811	335							
Herero			1192	876					
Sheneke	2002	1667							
Mean	1884	1167	1635	822	1567	729			

* Year planted.