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Effects of Agromorphological Traits of Ethiopian Mustard (*Brasica Carinata* A. Braun) Landraces in Oil and its Quality Traits

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Abstract: *The experiment was carried out to assess the effects of agro morphological traits on quantity and quality of oil productions of Ethiopian mustard landraces at Holetta Agricultural research Center, Ethiopia. Therefore forty nine genotypes of Ethiopian mustard land races collected from different agro ecologies were evaluated to assess the effect of agro morphological traits on quantity and quality of oil traits produced. The experiment was carried out in a simple lattice design. Univariate analysis of variance showed that there were significant differences among genotypes for all agro morphological traits, quantity and oil quality related traits compared. The significant difference indicates the existence of genetic variability reflection in genetic effects of agro morphological traits among the accessions which is important for improvement of these traits. The present study revealed the presence of considerable variability among genotypes for all traits assessed. The significant difference of results indicates that the presence of good opportunity to improve these agro morphological, oil yield quantity and quality related traits of Ethiopian mustard using the tested genotypes.*

Keywords: *Ethiopian mustard agro morphological traits, Oil, Oil quality traits, Univariate, Analysis*

1. Introduction

The genus *Brassica* of *Brassicaceae* family as a whole is believed to have originated around the Mediterranean, Eastern Afghanistan and the adjoining portion of Pakistan and North-Eastern Africa (Hemingway, 1976). The genus includes six economically important species, namely, *Brassica rapa*, *B. oleracea*, *B. nigra*, *B. juncea*, *B. napus*, and *B. carinata* (Doweny and Robbelen, 1989). Ethiopian mustard is believed to be originated in the highlands of the Ethiopian plateau and the adjoining portion of East Africa and the Mediterranean coast (Gomez-Campo and Prakash, 1999).It evolved as a natural cross between *B. nigra* (BB) (n=8) and *B. oleracea* (CC) (n=9) and underwent further chromosomal doubling (2n=34; UN, 1935). It is partially amphidiploids.

The crop is traditionally used for many purposes, such as greasing traditional bread-baking clay pan, curing certain diseases and as a source of vegetable relish (Nigussie, 2001). It is the only highland oil seed vegetable crop able to consume by defoliating its leaves or sold to generate income after month of sowing in most near big city parts of the country. Crop improvement through plant breeding, thus, occurs through selection operating on genetic variability. Genetic variability is therefore essential for crop improvement. In characterization of Ethiopian mustard for vegetative agro-morphological traits Jane Muthoni, (2010) reported as great variation was seen in leaf number per plant, leaf bloom and leaf blade blistering. Identifying agro morphological traits of Ethiopian mustard that is heritable to be reflected as effects on quantity and quality of oil production is crucial for further investigation of improvement program of the crop. Therefore the present study was, executed with the objective of assessing the effect of agro morphological traits of Ethiopian mustard land races in relation to quantity and quality of oil production.

2. Materials And Methods

Experimental Site

The experiment was conducted at Holetta Agricultural Research Center in 2013/2014 cropping season from June to December 2013. Holetta (West Shewa Zone of Oromia Region) is located at latitude 9^{o}

N and longitude 38^{o} E, altitude of 2400 m a.s.l situated 30km West of Addis Ababa. It is one of the representatives of oil seed *Brassica* growing areas in the central highlands of Ethiopia (Nigussie and Mesfin, 1994). The area has a mean annual rainfall of 1059 mm and temperatures of 23^{o}C (maximum) and 8^{o}C (minimum). The soil type is Nitisols with soil ph in the range of 6.0 -7.5(Nigussie and Mesfin, 1994).

2.1. Description of Test Materials

A total of forty-nine mustard land races that include one local check and one standard check were used in this study. The majority of the accessions represent the national collection from different major mustard growing regions of the country and that are maintained at Holetta agricultural research Center. The accessions were obtained kindly from Holetta agricultural research center of highland oil crops improvement project. The details of the accessions used in the experiment are given in Table 1.

Table1. *List of 49 Ethiopian mustard genotypes used in the study and their origin*

No.	Accession number	Area of collection	Altitude(m)	Latitude	Longitude
1	PGRC/E 20001	West Wollega/Arjo	2420	08-44-00N	36-40.00E
2	" 20002	Bale Zone/Kitu	2500	06-.59.00N	39-12-00E
3	" 20004	South Gonder/Liba	1980	12-.05-00N	37-44-00E
4	" 20005	SouthGonder/Debretabor	1830	11-57-00N	37-37-00E
5	" 20006	South Gonder/Debretabor	1980	11-50-00N	37-37_00E
6	" 20007	North Gonder/Woger/Dabat	2500	*	*
7	" 20017	West Gojiam /Awi /Dangila	1980	11-.20-00N	36-58-00E
8	" 20056	West Shewa/Jibatenamecha	2200	09-01-00N	38.-20-00E
9	" 20065	West Shewa/Jibatena mecha	2200	08-58-00N	37-30.00E
10	" 20066	West Shewa/Ambo	1950	08-.59.00N	37-48-00E
11	" 20067	West Shewa/Ambo	2010	08-.58-00N	37-52-00E
12	" 20076	SNNP/Wenago	1853	06-23-00N	38-20-00E
13	" 20077	South East Tigray/Inderta	2000	13-29-00N	39-30.00E
14	" 20112	West Gojam/JabiTehnan	1980	10-.39.00N	37-24-00E
15	" 20117	West Shewa/Jibatnamecha	2050	08-.58-00N	38-01-00E
16	" 20127	West Shewa/chelia	1700	09-03-00N	37-10-00E
17	" 20133	West Shewa/Menagesha	2600	09-11-00N	39-09.00E
18	" 20134	West Shewa/Jibat	2200	08-.58.00N	37-30-00E
19	" 20146	West Gojam/Bahirdarzuria	1980	11-.25-00N	37-12-00E
20	" 20165	West Gojiam/Awi/Dangila	1980	11-20-00N	36-58-00E
21	" 20166	West Gojiam/Awi/Dangila	1980	11-20-00N	36-58.00E
22	" 21008	Arsi/Gedeb	2380	07-.12.00N	38-09-00E
23	" 21012	West shewa/Dendi	2900	09-.14-00N	38-53-00E
24	" 21017	West Shewa/Gendbert	2470	09-43-00N	37-46-00E
25	" 21026	West Gojiam Awi/Dangila	2000	11-18-00N	36-58.00E
26	" 21035	West Gojam/Sekela	2540	10-.50-00N	37-04-00E
27	" 21037	West Gojiam/Awi/Dangila	2165	11-.14-00N	36-51-00E
28	" 21068	Bale/Adaba	2500	07-01-00N	39-25-00E
29	" 21157	SNNP /South omo	2830	06-19-00N	38-52-00E
30	" 21225	East Gojam/Enemay	2000	10-.32-00N	38-09-00E
31	" 208411	West Gonder/Debretabor	2150	11-.50-00N	37-35-00E
32	" 229665	West Gojam/Burie	2050	10-33-00N	37-34-00E
33	" 237048	Arsie-Robe	2350	07-08-00N	40-00.00E
34	" 241907	South Gonder/Fogera	1825	12-.01-00N	37-43-00E
35	" 241910	South Gonder/Farta	2289	11-.49-00N	38-00-00E
36	" 242856	Arsi zone /Sherka	2360	07-32-64N	39-37-87E
37	" 242858	Arsi zone /Sherka	2360	07-34-27N	39-31-24E
38	" 243738	South Wollo/Desiezuria	2928	11-08-00N	39-13-00E

39	" 243739	South Wollo/Tenta	2950	11-.14-00N	39-15-00E
40	" 21256	West Gojam/Bahirdarzuria	1940	11-16-00N	36-59-00E
41	" 243750	Wollo/kalu	2020	11-45-00N	39-47.00E
42	" 2243756	South Gonder/ Debark	3115	11-.08.00N	37-56-00E
43	" 243761	Gonder Zuria	2050	12-.19-00N	37-33-00E
44	" 243763	South Gonder/Kemkem	2070	11-57-00N	37-37-00E
45	" 208556	West Shewa/Adis Alem	2200	*	*
46	" 208585	East Shewa/yerer	1600	*	*
47	Yellow dodolla	Bale/Dodolla	2500	06-.59-00N	39-12-00E
48	(ZemX Yellow Dodolla)	Cross	2400	09-00-00N	38-00-00E
49	Local check	Holetta area	2400	09-00-00N	38-00-00E

Source: *Holetta highland oil crops research program,*=information not found*

2.2. Experimental Design, Management and Season

The experiment was executed from June 2013 to December 2013. The experiment was laid out in simple lattice design with two replications. A plot of four central rows each three-meter long and 30cm spacing between rows were used for data collection. Each replication had seven blocks and each block was represented by seven plots. The path between blocks was 2 m and the spacing between plots with in sub-blocks was also 0.6 m. Each entry was manually drilled a rate of 10 kg/ha and urea and phosphorous fertilizers were applied at the rates of 46/69 kg/ha N/P_2O_5 respectively following the national recommendations. All other recommended agronomic and cultural practices were carried out following practices described by Adefris (2005).

3. DATA COLLECTED

- **Data Collected on Plot Basis**

1. Seed yield per plot (SYP): Seed yield per plot measured in grams after moisture of the seed was adjusted to 7 percent.

2.Oil content (Oc): The proportion of oil in the seed to total oven dried seed weight measured by nuclear magnetic resonance spectroscope as described by Oregon state university seed laboratory proudly procedures._WWW. Seed lab oregonstate. ed/node/158.

3**.** Oil yield (Oy): The amount of oil in grams obtained by multiplying seed yield per plot by corresponding oil percent.

4. Oil quality trait analysis**:** oil quality traits like palmic, stearic, oleic, linoleic, linolenic, and erucic acid were measured by nuclear infrared spectroscope.

- **On plant basis.**

These data was collected from five plants randomly selected from the central rows of each plot and averaged for statistical analysis.

1. Petiole length: average measurements of the petiole length from bottom, middle and top of five plants of leaves excluding leaves.

2. Leaf length (cm): average measurements of the leaf length from bottom, middle and top of five plants. From each leaf starting from the base to the apex of leaf blade excluding petiole was measured at full vegetative stage.

3. Leaf width (cm): An actual measurement across the widest portion/section of the same leaf was at full vegetative stage.

4. Leaf area index: was measured using leaf area meter from bottom, middle and top of five plants for three leaf blade.

4. RESULTS AND DISCUSSION

The analysis of variance for the 13 agro morphological and oil quality related traits studied is given in Table 2. The analysis of variance showed that there were significant differences among genotypes for

all agro morphological, oil yield quantity and oil quality related traits compared. Among analyzed agro morphological traits highly and significantly differences were observed in date of maturity, oil content percent, petiole length, leaf length, leaf width, leaf area and for all oil quality related traits. The significant difference indicates the existence of genetic variability among the accessions that is important for selection and breeding. Yared,(2010) studied thirty six genotypes of mustard seed yield per plot, oil content, oil yield, number of seed per plant, palmatic, stearic, oleic, linoleic linolenic and erucic acid of traits found the same result. Similarly Rabbani *et al*, studied 52 mustard accessions for various both agronomic and physiological interest (Revilla and Tracy, 1995) and found considerable level of diversity among the executed experiment.

Table2. *Mean squares for different sources of variations for 13 agro morphological and oil quality traits of Ethiopian mustard*

Characters	Genotype (48)	Block (12)	Replication(1)	Intera-block error (36)
Date of Maturity	141.98**	6.39	0.91	9.96
Seed yield per plot	503441*	925530	7543862	231667
Oil content	3.4446**	1.3825ns	217.51	1.1283
Oil yield	108661*	167934	2098030	46331
Petiole length	11.6242**	2.7005	32.229	2.6565
Leaf length	6.1553**	2.072	22.6368	2.4629
Leaf width	5.8638**	1.8471	22.5408	2.1336
Leaf area	7.3403**	2.0052	25.0026	2.1764
Palmic acid	0.2691**	0.0661	0.0072	0.05179
Stearic acid	0.034**	0.0073	0.0002	0.00757
Oleic acid	2.2211**	1.1983	4.1164	0.598
Linoleic acid	2.2839**	1.5701	4.1291	0.4673
Linolenic acid	11.342**	1.444	7.3909	1.3781
Erucic acid	7.165**	4.959	23.078	1.846

**, ** significant at p = 0.05 and 0.01 significance level, respectively; ns= non-significant*

Mean and Range Values of Ethiopian mustard Agro morphological and Oil quality related Traits

The mean performance of the studied genotypes for effects of 13 agro morphological and oil quality related traits are presented in Table 3. The range of seed yield per plot was from 904 to 3297kg of seeds. Among the tested genotypes 24 genotypes which are 48.99 percent had shown greater seed yield per plot than the grand mean value while 25 genotypes, i.e. 51.02 percent, showed least mean value than the grand mean.

The oil content of genotypes tested ranged 39.1 % to 46.0 % while oil yield ranges from 370.4kg to1478kg. The maximum oil content was recorded by genotype PGRC/E 208585 and the minimum was also recorded for the genotype PGRC/E20133. Mean values for the genotypes of PGRC/E20112, PGRC/E 20165, PGRC/E21026 and PGRC/E 21256, PGRC/E 208585 shows 45.4%, 44.7%, 45.5% and 44.5 and 46.0% the highest oil content than the standard check yellow dodolla (44.4%) respectively. The maximum oil yield was recorded for the standard check yellow dodolla genotype and the minimum oil yield was recorded for genotype PGRC/E20065. From the studied genotypes none of genotypes showed greater oil yield than the standard check yellow dodolla. The mean value of the 25 genotypes tested for this study had shown greater oil content percent than the grand mean of the tested genotypes. Similarly 23 genotypes showed greater oil yield than grand mean of oil yield.

Similarly the mean of leaf length, leaf width and leaf area agro morphological traits are presented in Table 3. Mean value of leaf length of the tested genotypes ranged from 4.6 cm to 11.2 cm. The longest leaf length (11.8 cm) was recorded for the genotype PGRC/E243756 while the shortest leaf length (4.6 cm) was recorded for the genotype PGRC/E 21068.The mean value for Leaf width ranges from 2.1 cm for genotype PGRC/E 21068 and 8.8 cm for the genotype PGRC/E 2243756.The mean value of leaf area for the tested genotypes also ranges 3.1 cm for the genotype PGRC/E21068 to 10.6 cm for the genotype PGRC/E243756. Among the tested genotypes for leaf length, leaf width and leaf area the mean value of all these characters indicated that genotype PGRC/E 243756 was the first.

The mean and range values of the studied 49 genotypes of Ethiopian mustard for oil quantity and quality parameters are presented in table 3. Regarding seed oil quality traits, the palmic, stearic, oleic, linoleic, linolenic, and erucic acid of the genotypes ranged from 2.76 to 4.55, 0.64 to 1.17%, 6.91 to

11.51, 15.59 to 20.9, 9.61 to 17.39 and 40.1-49.1 respectively. The highest palmic mean value was shown by the genotype PGRC/E21225 where as the lowest was by the genotype PGRC/E 20065. The highest value of stearic (1.174)was shown by the genotype PGRC/E 208411 and the lowest (0.64) by genotype PGRC/E 21008.The highest value of oleic acid(11.51) was shown by genotype PGRC/E 20017, whereas the lowest(6.91) was by genotype (zem x yellow). The highest value (20.09) for linoleic was recorded by genotype PGRC/E 21225 and the lowest (15.59) was recorded by genotype PGRC/E 21017.

The highest mean value (17.39) for linolenic was recorded by genotype PGRC/E 21008 and the lowest (7.61) was recorded by genotype PGRC/E 208411. Among tested genotypes the highest oil content (46.0%) was recorded for PGRC/E 208585and the lowest for the genotype PGRC/E20133. Generally, these results indicate that those traits which had wide range of variations will serve for breeding and selection for improvement of the trait desired. A wide range of variations was recorded for traits for example Date of maturity, seed yield per plot, oil content, oil yield, Leaf length, leaf width, etc.

Table3. *Mean and range values of the studied 49 genotypes for 13 agro morphological and oil quality traits of Ethiopian mustard tested at Holetta, 2013/14*

Genotypes		DF	SYPP	OC	OY	LL	LW	LA	Palmic	Stearic	Oleic	Linoleic	Linolenic	Erucic
1	PGRC/E 20001	95	2045	43.8	904	10.5	6.0	8.2	3.96	0.93	9.47	16.99	10.94	45.38
2	" 20002	81	1334	41.9	472	5.5	3.3	4.2	3.83	0.72	8.16	19.21	15.18	45.95
3	" 20004	90	1390	42.5	609	8.2	4.6	6.1	3.64	1.05	9.90	16.80	10.05	43.70
4	" 20005	86	1805	42.9	773	6.8	4.6	5.7	3.94	0.82	9.77	17.86	13.95	43.47
5	" 20006	99	1733	42.7	748	8.9	6.5	7.8	3.46	0.97	9.50	16.88	10.83	43.53
6	" 20007	90	1975	43.2	881	8.1	5.0	6.3	3.60	0.86	8.74	16.96	12.33	44.63
7	" 20017	94	1866	43.5	817	9.6	6.2	7.6	3.40	1.05	11.51	16.82	10.54	40.47
8	" 20056	102	1226	41.8	515	7.4	6.0	7.2	3.79	0.98	9.50	17.24	10.18	44.13
9	" 20065	113	904	41.0	370	10.3	6.8	9.4	2.76	1.14	9.75	15.99	9.42	40.09
10	" 20066	91	1375	42.2	583	10.5	8.0	9.7	4.09	1.03	10.42	16.20	10.38	44.30
11	" 20067	89	2534	44.0	1106	7.6	4.7	6.1	4.09	0.95	9.25	16.96	12.76	45.70
12	" 20076	94	2580	43.0	1101	9.4	5.6	7.5	3.47	1.02	9.30	17.00	10.24	43.46
13	" 20077	85	1883	42.1	805	7.7	4.1	5.8	4.42	0.67	7.20	18.30	16.44	49.07
14	" 20112	98	2406	45.4	1084	8.8	6.9	7.5	3.56	1.00	9.51	16.75	10.67	42.25
15	" 20117	104	2080	43.0	901	9.6	7.0	8.5	4.02	1.09	9.51	16.31	9.24	43.68
16	" 20127	107	1846	42.4	789	10.6	7.4	9.4	4.08	1.02	11.36	16.83	10.39	41.83
17	" 20133	85	999	39.1	398	5.8	3.2	4.2	4.51	0.90	9.56	19.37	13.57	45.66
18	" 20134	102	2473	42.4	1044	11.1	8.1	10.1	4.26	1.02	10.27	16.12	10.07	44.22
19	" 20146	92	2360	43.7	1031	8.8	5.8	6.9	3.85	0.91	9.73	18.42	12.61	42.97
20	" 20165	97	2465	44.7	1111	10.3	7.2	8.5	3.65	0.95	10.17	16.35	11.46	42.41
21	" 20166	94	2362	43.5	1026	8.7	5.8	7.1	3.81	0.93	9.98	17.00	12.28	43.95
22	" 21008	82	1637	43.5	713	5.9	3.3	4.4	3.61	0.64	7.50	18.65	17.39	46.41
23	" 21012	102	2162	43.2	945	8.4	6.3	7.5	3.35	1.10	10.73	16.98	9.71	40.61
24	" 21017	105	2240	42.6	980	9.4	7.0	8.6	3.67	1.10	10.39	15.59	9.27	43.03
25	" 21026	99	3054	45.5	1364	9.0	6.7	7.5	3.78	1.07	10.41	16.72	9.21	42.57
26	" 21035	106	1643	43.3	700	10.9	8.4	10.3	3.96	0.91	10.29	17.96	12.26	43.74
27	" 21037	94	2639	43.1	1217	9.9	7.1	8.7	3.69	1.05	10.52	17.72	10.54	41.80
28	" 21068	79	1804	41.3	739	4.6	2.1	3.1	3.19	0.72	7.24	17.42	14.78	46.82
29	" 21157	90	1342	41.1	585	10.4	7.6	9.4	3.57	0.92	10.07	17.28	14.26	41.81
30	" 21225	79	1928	41.5	809	6.0	2.6	3.8	4.55	0.79	9.72	20.09	15.17	44.68
31	" 208411	100	1586	43.9	704	8.0	5.3	6.7	3.32	1.17	10.75	17.32	7.61	42.63
32	" 229665	100	1904	43.7	817	11.0	8.2	9.2	4.13	1.05	9.69	16.98	9.78	43.28
33	PGRC/E 237048	109	1688	41.5	713	10.9	8.1	9.8	4.27	0.71	7.32	18.76	12.70	48.28
34	" 241907	93	1988	41.6	848	8.1	5.7	6.8	3.78	0.93	9.04	16.83	10.35	45.03
35	" 241910	93	2566	43.1	1100	8.0	5.5	6.8	3.84	0.94	10.33	17.40	12.50	44.29
36	" 242856	90	2135	41.5	892	7.7	4.5	6.1	4.09	0.85	8.97	18.85	13.48	43.62
37	" 242858	97	2019	41.3	832	9.5	6.3	8.6	4.11	0.94	10.41	17.78	11.65	43.67
38	" 243738	88	2022	41.3	862	6.8	3.7	4.9	4.01	0.83	9.13	18.98	15.07	45.31
39	" 243739	86	2231	44.2	982	5.7	3.4	4.5	4.23	0.81	8.14	18.85	14.96	46.98
40	" 21256	98	2291	44.5	1021	11.1	8.1	9.8	3.50	1.06	9.76	16.79	8.75	41.67

41	" 243750	85	2142	42.5	934	7.4	4.4	5.6	3.47	0.76	8.48	19.12	15.12	44.18
42	" 2243756	108	1859	42.7	797	11.2	8.8	10.6	3.66	1.01	10.01	16.97	10.32	41.17
43	" 243761	88	1931	43.5	846	8.9	6.6	8.2	3.53	0.93	9.44	17.44	11.48	43.29
44	" 243763	95	1348	42.1	563	7.5	5.4	6.6	3.95	0.87	9.92	17.32	11.86	42.60
45	" 208556	86	1879	44.2	846	7.5	5.1	6.2	3.72	0.89	9.06	16.97	13.84	43.91
46	" 208585	94	2142	46.0	973	10.0	7.8	9.1	3.65	0.87	8.49	17.34	15.73	44.22
47	Yellow dodolla	85	3297	44.4	1478	6.9	4.4	5.5	3.21	0.93	8.02	17.52	14.55	43.29
48	(ZemXY.Dodolla)	80	2603	43.8	1157	7.2	4.2	5.4	3.57	0.65	6.91	18.40	16.99	46.32
49	Local check	85	2212	42.4	934	6.0	3.4	4.4	4.44	0.85	9.57	18.43	13.10	45.69
Range		79-113	904-3297	39-46	370-1478	4.6-11.2	2.1-8.8	3.1-10.6	2.8-4.6	0.64-1.17	6.91-11.51	15.59-20.09	7.61-17.39	40.1-49.07
Mean		93	1999	42.9	866	8.5	5.7	7.2	3.8	0.92	9.44	17.5	12.16	43.91
CV (%)		3.38	24.08	2.477	24.86	18.4	20.6	36.8	5.99	9.39	8.19	3.91	9.65	3.09
LSD (0.05)		6.34	2.13	474.4		3.155	2.966	57.37	0.46	0.18	1.66	1.50	2.36	2.96

DM: date of Maturity, SYP: Seed yield per plot, OC: oil content, OY: oil yield, LL, LW = leaf, width length respectively, LA= leaf area , Y:yellow

Correlation Analysis: Correlation among various agro morphological, quantity and oil quality related traits are presented in Table 4. For the tested agro morphological traits within 49 Ethiopian mustard genotypes all of the characteristics showed high and significant correlation. Measurements of all agro morphologic, quantity and quality related traits were positively and significantly correlated with each other except negatively correlated lenolenic (r:-0.07) with leaf length(r:-0.22) and lenolenic with leaf area(r:-0.18). When we see the date maturity with all agro morphological and quality traits it was positively and highly associated with all traits correlated. The correlation date of maturity range for tested agro morphological traits(r: 0.301) for linolenic to (r: 0.879) for oil content. Similarly seed yield per plot correlation ranges r: 0.249 (for leaf area) to r: 0.995 (for oil yield per plot). Oil content was positively and highly correlated with erucic acid (r: 0.927). The correlation between oil yield and erucic acid (r: 0.57) was the highest where as the least was between leaf area(r 0.260). Among tested genotypes for agro morphological traits correlation between oil content with erucic acid(r: 0.927), oil yield with erucic acid (r: 0.537), palmitic with erucic(r: 0.890) linoleic with erucic(r: 0.945) and lenolenic with erucic (r.0726) were the highest correlation. The correlation of leaf length with leaf width (r =0.94), as well as leaf area (r: 0.97) was highly and significantly correlated with the component traits.

Table4. *Correlation coefficient between 13 agro morphological traits of Ethiopian mustard landraces*

	DM	SYP	OC	OY	Palmic	Stearic	Oleic	Linoleic	Linolenic	Erucic	PL	LL	LW	LA
DM	1													
SYP	0.465	1.000												
OC	0.879	0.688	1.000											
OY	0.443	0.995	0.671	1.000										
Palmic	0.736	0.494	0.804	0.453	1.000									
Stearic	0.852	0.460	0.739	0.459	0.521	1.000								
Oleic	0.847	0.438	0.765	0.424	0.660	0.902	1.000							
Linoleic	0.743	0.534	0.884	0.496	0.875	0.489	0.611	1.000						
Linolenic	0.301	0.388	0.589	0.359	0.605	-0.037	0.135	0.785	1.000					
Erucic acid	0.801	0.572	0.927	0.537	0.890	0.556	0.608	0.945	0.726	1.000				
PL	0.523	0.136	0.278	0.136	0.161	0.520	0.453	0.062	-0.231	0.143	1.000			
LL	0.739	0.363	0.551	0.371	0.418	0.708	0.642	0.294	-0.071	0.400	0.817	1.000		
LW	0.640	0.254	0.408	0.271	0.263	0.637	0.556	0.115	-0.223	0.220	0.844	0.940	1.000	
LA	0.680	0.249	0.439	0.260	0.309	0.661	0.583	0.170	-0.177	0.278	0.879	0.970	0.983	1.000

5. CONCLUSION

In this study, 49 Ethiopian mustard genotypes acquired from diverse zones/regions of Ethiopia were evaluated in simple lattice design with two replications at Holetta Agricultural Research Center, West

Shewa zone, Therefore the present study was, executed with the objective of assessing the effect of agro morphological traits of Ethiopian mustard land races in relation to quantity and quality of oil production. The analysis of variance showed that there were significant differences among genotypes for all agro morphological, oil yield quantity and quality related traits compared. Among analyzed agro morphological traits highly and significantly difference was observed in date of maturity, oil content percent, petiole length, leaf length, leaf width, leaf area and for all oil quality related traits. Only seed yield per plot and oil yield was significant. The significant difference indicates the existence of genetic variability among the accessions that is important for selection and breeding program. For the tested agro morphological traits within 49 Ethiopian mustard genotypes all of the characteristics showed high and significant correlation. Measurements of all agro morphologic, quantity and quality related traits were positively and significantly correlated with each other except negatively correlated lenolenic with leaf length and lenolenic with leaf area. Further similar study on variability of metric characters using biotechnological tools would also help in substantiating the result obtained.

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