

CHARACTERIZATION OF LEAFY ETHIOPIAN MUSTARD (*BRASSICA CARINATA* A. BRAUN) GERMPLASM BASED ON MORPHOLOGICAL DESCRIPTORS

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ABSTRACT

Ethiopia is believed to be the primary center of origin and diversity of *Brassica carinata* A. Braun known as Ethiopian mustard. 36 Ethiopian mustard accessions were used to evaluate the qualitative characterization and scores were used as descriptors for Brassica and Raphanus. The Ethiopian mustard genotypes were characterized for six groups of qualitative traits viz. plant growth habit, leaf color, leaf blade shape, leaf division margin, leaf hairs and leaf blade thickness. The research result revealed that the 36 Ethiopian mustard genotypes were grouped into two categories for plant growth habit in which 11.11 and 88.9% categorized under short non branching stem supporting leaf rosette and elongated non branched stems forming supporting leaf, respectively. A total of 20 (55.6%) and 16 (44.4%) of genotypes had green and light-green leaf colors, respectively. The genotypes also grouped in to four for leaf blade shape in which most of the accessions them fall 27.8, and 55.6%, were under elliptic and ovate, respectively. The remaining were, obovate and lancolate. Moreover, the genotypes were grouped into two categories of leaf division margin in which 27(75%) and 9(25%) of genotypes categorized under crenate and dentate, respectively. The largest proportion of genotypes had devoid of leaf hairiness (90%), and the remaining (10%) show sparse, in which from total 32 genotypes under no leaf hair and only 4 genotypes sparse leaf hair on external leaf. All check varieties show no leaf hair.

KEYWORDS: Leafy, Morphology, qualitative, characters.

INTRODUCTION

Ethiopian mustard is believed to have originated from the Ethiopian highlands and its cultivation is thought to have started about 4000 years B.C. (Schippers, 2000; Nigussie and Becker, 2002). It is cultivated as an oil and leafy vegetable crop in the Ethiopian highlands at altitudes between 1500 and 2600 m. Ethiopian mustard is one of the African indigenous vegetable grown and consumed in most parts of Africa mainly as leafy vegetable but in Ethiopia, it is among the oldest oil crops (Nigussie and Becker, 2002).

In Ethiopia its total area in hectare and total production in quintal for 2015/16 are estimated to be 29,989.17 and 550,429.93, respectively, at private peasants' holdings level, with an average productivity of 1.83 tha^{-1} (CSA, 2016/17). For use as leafy vegetables, *Brassica carinata* produced the greatest number of leaves and in height clearly exceeded both parental species and others. In the case of stem biomass, *Brassica carinata* was much larger than any other *Brassica* species. Among the allopolyploids, both *Brassica carinata* and *Brassica juncea* were characterized by phenotypic values higher than either of their respective parents (Shippers, 2000). It

is resistant to disease insect pests like aphids and flea beetles and some accessions have high levels of resistance to alternaria black spot (Getenet *et al.*, 1996).

Characterization of crops is a very essential first step in any crop improvement programme (De Vicente *et al.*, 2005). Characterization of genetic resources, therefore, refers to the process by which accessions are identified, differentiated or distinguished according to their character or quality (traits) (Merriam-Webster, 1991). In the absence of sufficient information for characterization of leafy Ethiopian mustard genotypes, the descriptive qualitative characterization genotypes has importance and thus exploit such variations in breeding programme to develop varieties with acceptable qualitative leaf character. Thus; this study developed with objective of assessing qualitative morphological evaluation among collections of the Ethiopian mustard genotypes

MATERIALS AND METHODS

For this study, 36 genotypes of Ethiopian mustard collected from diverse agro ecological locations of Ethiopia were used. The genotypes were obtained from Holleta Agricultural Research Center of Ethiopia.

The qualitative traits were visually determined by comparing pictures and descriptions given for the crop in the descriptors for *Brassica* and *Raphanus* (IBPGR, 1990). The following qualitative traits were relevant to the study objectives and data were collected on plot basis i.e. plant growth habit, leaf color, leaf division margin, leaf blade shape, leaf hairiness and leaf blade thickness.

RESULTS AND DISCUSSIONS

Qualitative traits of Ethiopian Mustard genotypes leaf

The Ethiopian mustard genotypes were characterized for six groups of qualitative traits viz. plant growth habit, leaf color, leaf blade shape, leaf division margin, leaf hairs and leaf blade thickness.

Plant growth habit and Leaf color

The 36 Ethiopian mustard genotypes were grouped into two categories for plant growth habit in which 11.11 and 88.9% categorized under short non branching stem supporting leaf rosette and elongated non branched stems forming supporting leaf, respectively. A total of 4 and 32 genotypes had shorten non branched stem supporting leaf

rosette and elongated non branched stems forming supporting leaf, respectively. From five checks all of them showed elongated non branching stems forming supporting leaf. A total of 20 (55.6%) and 16 (44.4%) of genotypes had green and light-green leaf colors, respectively. All check variety's showed green color on surface of leaf.

Leaf blade shape and Leaf division margin

The genotypes also grouped in to four for leaf blade shape in which 27.8, 55.6%, 5.6%, 11.1, of accessions were under elliptic, ovate, obovate and lancolate, respectively. Major variation observed for leaf blade shape total of 10, 2, 20 and 4 genotypes had under elliptic, obovate, ovate, and lancolate, respectively. From five check varieties only two Holleta-1 Yellow seed and S 67 Brown seed show obovate the rest one show elliptic. The 36 Ethiopian mustard genotypes were grouped into two categories of leaf division margin in which 27(75%) and 9(25%) of genotypes categorized under crenate and dentate, respectively. All check varieties except Yellow dodola show crenate in leaf division margin.

Table 1: Description for 6 qualitative traits according to IBPGR (1990) descriptors for *Brassica* and *raphanus*.

Parameters	Character codes
Plant growth habit	1. Shortened non branching stem supporting leaf rosette
	4. Elongated or enlarged non branching stems forming supporting leaf
Leaf color	2 Light-green 3 green
Leaf division margin	1 crenate 2 dentate
Leaf blade shape	2 elliptic 3 Obovate 5 ovate 6 lancolate
leaf hairiness	0 absent 3 sparse
leaf blade thickness	3 thin 5 intermediate

Leaf hairs and Leaf blade thickness

The largest proportion of genotypes had devoid of leaf hairiness (90%), and the remaining (10%) show sparse, in which from total 32 genotypes under no leaf hair and only 4 genotypes sparse leaf hair on external leaf. All check varieties show no leaf hair. Similarly largest proportion of genotypes had thin (90%) and (10%) show intermediate leaf blade thickness, in which 32 genotypes were thin and only 4 genotypes had intermediate leaf blade thickness. All check varieties show thin leaf blade thickness.

Leaf blade color at fully developed leaf stage revealed that 25 (83.34%) genotypes among 30 were found to be green while 4 (13.34%) genotypes were blue-green and only one genotype was found to be of purple color. Leaf shape showed variation from very narrow elliptic, narrow elliptic to elliptic with 11 (36.67%) genotypes very narrow elliptic and 4 (13.34%) was elliptic in kale genotypes (Gorka *et al.*, 2018). Esawi (2012) observed that most of accessions were of green seedling leaf color (48%) also light green color of seedling leaf is represented by a high percentage (30%). While only 2 accessions of common cabbage were of purple green

seedling leaf color. Highest number of leaves, orbicular leaf blade shape, dentate leaf margin, green leaf color, absence leaf hairiness was the characteristics of collected accessions. Muthoni (2010) observed from 47 genotypes of Ethiopian mustard 31 genotypes were green and others light green leaf colour. He also reported that 36% of genotypes had dentate leaf margin.

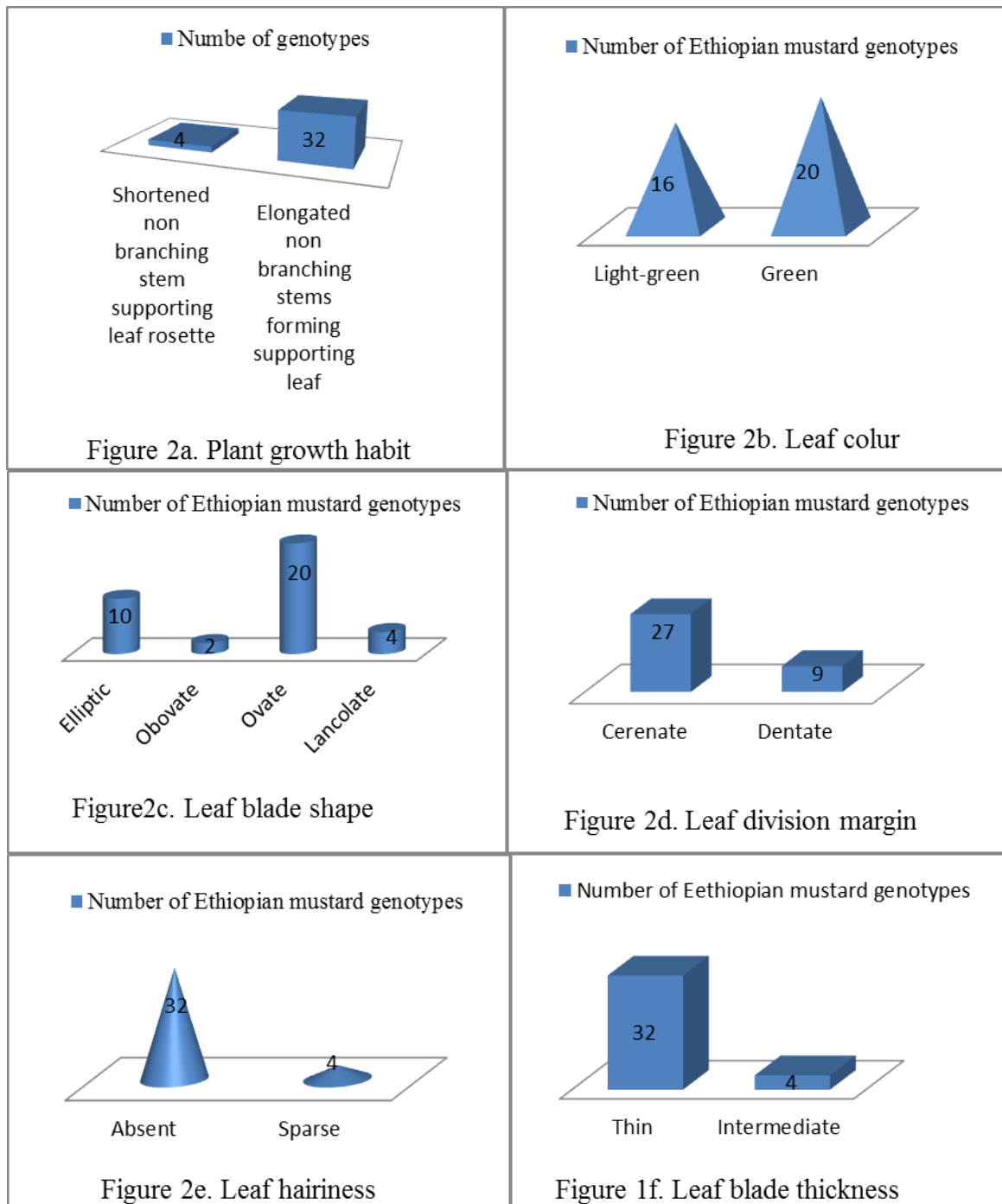


Figure 1: A- F. Distribution 36 Ethiopian mustard genotypes into six different categories of qualitative traits.

SUMMARY AND CONCLUSION

Ethiopia is believed to be the primary center of origin and diversity of *Brassica carinata* A. Braun known as Ethiopian mustard. 36 Ethiopian mustard accessions were used to evaluate the qualitative characterization and scores were used as descriptors for *Brassica* and *Raphanus*. The Ethiopian mustard genotypes were characterized for six groups of qualitative traits viz. plant growth habit, leaf color, leaf blade shape, leaf division margin, leaf hairs and leaf blade thickness. The research result revealed that the 36 Ethiopian mustard genotypes were grouped into two categories for plant growth habit

in which 11.11 and 88.9% categorized under short non branching stem supporting leaf rosette and elongated non branched stems forming supporting leaf, respectively. A total of 20 (55.6%) and 16 (44.4%) of genotypes had green and light-green leaf colors, respectively. The genotypes also grouped in to four for leaf blade shape in which most of the accessions them fall 27.8, and 55.6%, were under elliptic and ovate, respectively. The remaining were, obovate and lancolate. Moreover, the genotypes were grouped into two categories of leaf division margin in which 27(75%) and 9(25%) of genotypes categorized under crenate and dentate, respectively. The largest proportion of genotypes had

devoid of leaf hairiness (90%), and the remaining (10%) show sparse, in which from total 32 genotypes under no leaf hair and only 4 genotypes sparse leaf hair on external leaf. All check varieties show no leaf hair. This qualitative morphological evaluation characteristics in combination with quantitative characters has importance in breeding programme to develop varieties of Ethiopian mustard with acceptable qualitative leaf character.

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