International Journal of
Life Science
International Peer Reviewed Open Access Refereed Journal

Int. J. of Life Science, 2019; 7 (2):187-190
ISSN:2320-7817(p) | 2320-964X(o)

Original Article Open Access

Factor analysis of yield and yield related traits in durum wheat genotypes in Southern Tigray, Ethiopia

Muez Mehari* Adhiena Mesele and Assefa Workineh

Tigray Agricultural Research Institute, Alamata Agricultural Research center, P.O.Box56 Alamata, Ethiopia
*Corresponding Author email: muez97@gmail.com

Manuscript details:

Received: 23.01.2019
Accepted: 12.06.2019
Published : 20.06.2019

Editor: Dr. Arvind Chavhan

Cite this article as:
Muez Mehari, Adhiena Mesele and Assefa Workineh (2019) Factor analysis of yield and yield related traits in durum wheat genotypes in Southern Tigray, Ethiopia, *Int. J. of. Life Science*, Volume 7(2): 187-190.

Available online on
http://www.ijlsci.in
ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

ABSTRACT

To assess the relationship of traits in durum wheat a study was conducted in southern Tigray using twenty durum wheat genotypes during 2014.The experiment was replicated four times and laid out in a randomized complete block design. The durum wheat genotypes were evaluated for days to heading, days to maturity, plant height, and spike length, number of seeds per spike, thousand seed weight and Yield. All the traits had a wide range of agro-morphological variation except spike length. The seven traits were explained by the four factors capturing 85% of the variability in the data set. The first factor explained 30.89% of the variability and the traits maturity date and heading date was with higher positive coefficient greater than 0.5 and Eigen value 2.16. The second factor explained 22.46% variance in the data set with Eigen value1.57 and plant height ,grain yield and thousand seed weight where related in this factor and indirect selection using plant height and thousand seed weight could be effective in selecting of higher yielder durum wheat genotype.

Keywords: factor analysis, durum wheat, genotypes

INTRODUCTION

Tetraploid (2n = 4x = 28) wheat has been under cultivation in Ethiopia since ancient times and the country is considered as center of genetic diversity for these wheats (Vavilov, 1951). Among the tetraploids, durum wheat (*Triticum turgidum* L. Var. durum desf) is the predominant species in Ethiopia. It is traditionally grown by small-scale farmers (Efrem *et al*., 2000).

Ethiopia, with its range of altitudes, soils and climatic conditions provide ecological settings suitable for the cultivation of diverse species of wheat (Harlan, 1971). In Ethiopia durum and bread wheat species each occupy approximately equal proportion of the area under wheat production. However, change in the relative proportions of wheat types grown in Ethiopia has been reported more recently, with durum and bread wheat occupying approximately 30% and 70%, respectively (CSA,2010).

Durum wheat breeding have been have been undertaking in the country and selection of early generation in the target environment is an important for avoiding genotype by environment interaction and increase selection efficiency. Selection based on morpho-physiological traits is an alternative to conventional yield-based selection and even more efficient than yield-based selection and this could be the less interference of genotype by environment interaction and being lower heritability of grain yield (Annicchiarico and Pecetti, 1998).

Different analysis methods such as the simple correlation have been used for studying trait association but, they use of multivariate analysis methods such as factor analysis is important to reduce the dimensionality of the data set. Using factor analysis (Siahbidi et al., 2012) studied 14 traits in durum wheat and reduced into five factors and Zarei et al., 2013) studied 14 traits of durum wheat and explained by four factors Olgun *et al* .,2011 studied and 11bread wheat traits and come up with three factors explaining the data set. Hence, the objective of this research is to assess the trait association of durum wheat genotypes in Tigray using factor analysis.

MATERIALS AND METHODS

The present research was carried out in Ofla district, Tigray, Ethiopia, located at 12°31'N latitude and 39°33'E longitude. Twenty durum wheat genotypes (Table 1) were evaluated during 2014. The trial was laid in randomized complete block design with four replications. A plot consisting of six rows of 2.5 meter long with spacing of 0.2 meter between rows was used. A seed rate of 150 kg ha^{-1} and fertilizer rates of 62 and 46 kg ha^{-1} N and P_2O_5, respectively, were applied. Data such as days to heading ,days to maturity ,plant height, number of seeds per spike , spike length ,thousand seed weight and grain yield ,were collected on plot basis from the four central rows .

Statistical analysis

Factor analysis was done using the SPSS software 16.The principal component method (Harman, 1976) were used and data extraction method Eigen value greater than 1 was accommodated in the analysis. Varimax rotation was done on the data set for changing the geometric space of variables and helps to maximizing loading of variables on particular factor.

Table 1 Durum wheat genotypes used in the study

Entry code	name of genotype
1	34thIDONMD/89/off2011
2	IDON-2009_off/222/2009
3	DSP2009_off.F3.2H.291_meh.1H.158
4	DSP2009_off.F4.2H.695_meh.2H.245
5	CD11_Y10BEK SEL/25/off2011
6	CD11_Y10BIR SEL/97/off2011
7	CD10_MCDZ-off
8	CDS10MSELT-DZmeh81/2010
9	CD11_Y10BEK SEL/115/off2011
10	DSP2009_off.F4.2H.976_meh.3H.291
11	CD11_Y10 BIR SEL/197/off2011
12	CD11_Y10 BIR SEL/95/off2011
13	CD11_Y10 BIR SEL/98/off2011
14	CDS10MS ELT-DZmeh61/2010
15	34thIDONMD/110/off2011
16	DSP2009_off.F4.1H.429
17	34thIDONMD/111/off2011
18	Mukiye
19	Hitosa
20	local

RESULTS AND DISCUSSION

Trait variation in Durum wheat genotypes

The evaluated durum wheat genotypes had a wide range of agro-morphological variation in all traits studied except for spike length (Table 2).Higher trait variability was observed in thousand seed weight (54.8±5.74), days to maturity (110.7±5.63), plant height (78±5.5), number of seeds per spike (35.4±5.34) and yield (37.88±4.56).using descriptive statistics trait variability was assessed by Zarkti *et al*., 2012 in bread wheat genotypes.

Screen plot

it helps in determining the those factors explain most of the variability in the data set and accomplished by observation of the bending point of the elbow and Eigen value greater than 1 a (Figure 1) and the elbow fall down in factor four and the four factors adequately represent the variability in the data set.

Factor analysis

Factor analysis it is correlation method identifying character association between and among characters to bind them into underlying factor (Breseghello and Sorrells, 2006).The four factor explained 85% of variability in the data set .The first factor explained 30.89% of the variability and the traits days to maturity and days to heading was with higher positive coefficient greater than 0.5 and this factor is related growth stage .The second factor explained 22.46% variance in the data set and plant height ,grain yield and thousand seed weight where related in this factor and indirect selection using plant height and thousand seed weight could be effective in selecting of higher yielder durum wheat genotypes. The third factor explained additional 16.5% and spike length was with higher positive coefficient. The fourth factor captured further 15.1% variance in the data set and seed per speak related to this factor (Table 3).

Table 2 Descriptive statistics for the seven durum wheat traits

Variable	Observations	Minimum	Maximum	Mean	Std. deviation
Days to heading	20	62.500	74.000	67.325	3.839
Days to maturity	20	90.750	110.750	99.475	5.635
Plant height	20	68.700	90.250	78.020	5.519
Spike length	20	4.850	6.300	5.365	0.418
Thousand seed weight	20	43.900	70.050	54.830	5.741
Seed per spike	20	21.100	47.700	35.445	5.348
Yield	20	29.675	47.005	37.888	4.567

Table 3 Factor analysis by principle components using varimax rotation of 20 durum wheat genotypes

Variables	Factor 1	Factor 2	Factor 3	Factor 4
Days to heading	.873	-.143	.356	.072
Days to maturity	.931	.059	-.158	.037
Plant height	-.371	.798	-.084	-.019
Spike length	.036	.066	.965	-.038
Thousand seed weight	.169	.493	-.070	-.710
Seed per spike	.213	.266	-.077	.827
Yield	.364	.734	.385	.124
% of variance	30.89	22.46	16.53	15.1
Eigen value	2.16	1.57	1.15	1.06
Cumulative	30.89	53.35	69.88	85

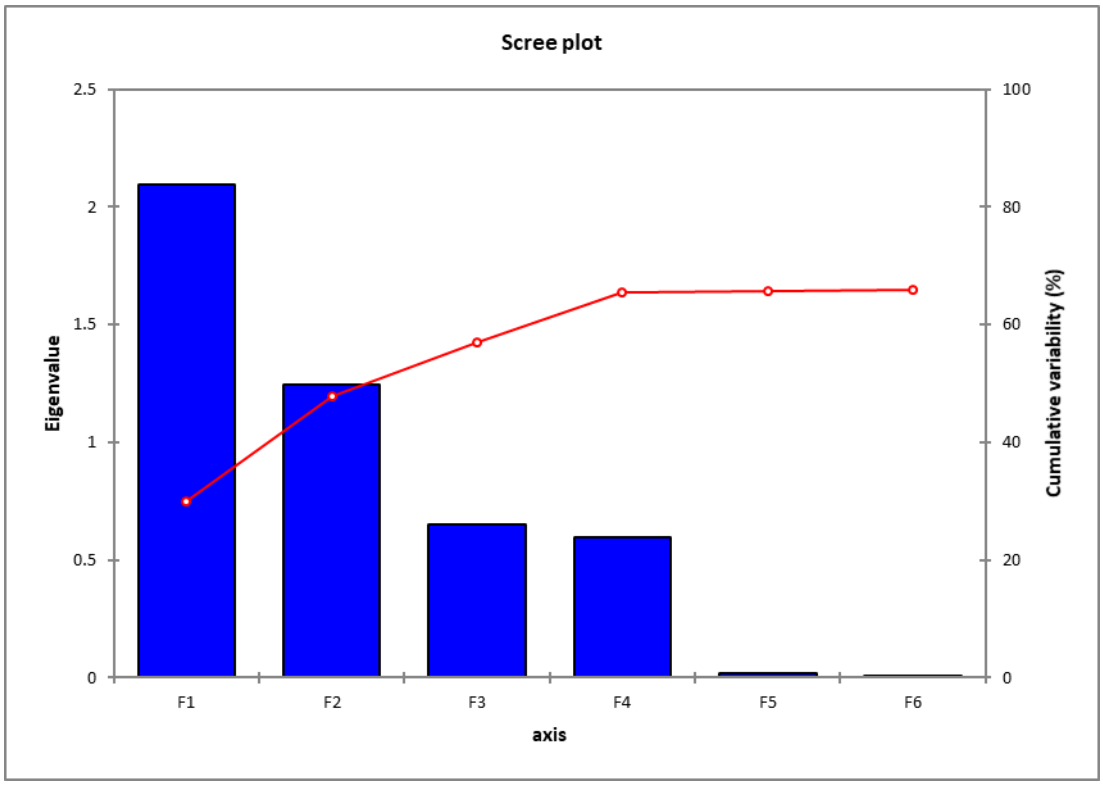

Figure 1 screen plot of Eigen value, number of factors and cumulative variance of 20 bread wheat genotypes.

Acknowledgements

We would like to thank to Alamata agricultural research center and Tigray Agricultural Research Institute for the support made during data collection. We would also like to thank for Kulumsa agricultural research center (WCoE), Debrezeit Agricultural Research Center and EAAPP wheat project for the finical support and follow up.

REFERENCES

Annicchiarico P and Pecetti L (1998) Yield vs. morphophysiological trait-based criteria for selection of durum wheat in a semi-arid Mediterranean region (northern Syria). *Field crops research*, *59*(3): 163-173.

Breseghello F and Sorrells ME (2006) Association Mapping of Grain Size and Milling Quality in Wheat (*Triticum aestivum* L.) Cultivars. Genetics. 172: 1165-1177.

CSA (2010) Federal Democratic Republic of Ethiopia Central Statistics Agency (CSA) Crop Production Forecast Sample Survey, 2010/11 (2003 E.C.) In: Report on Area and Crop Production forecast for Major Grain Crops (For Private Peasant Holding, "Meher" Season) Statistical Bulletin.

Olgun M and Aygün C (2011) Evaluation of yield and yield components by different statistical methods in wheat (T. aestivum L.). *CEP*, *88*, 900.

Siahbidi MMP, Aboughadareh AP, Reza G, Tahmasebi AS and Jasemi M (2012) Factor analysis of agro-morphological characters in durum wheat (Triticum durumDesf.) lines. *Intl J Agri Crop Sci*, *4*(23): 1758-1762.

Walton PD (1971) The use of factor analysis in determining characters for yield selection in wheat. *Euphytica* 20: 416–421.

Walton PD (1972) Factor analysis of yield in spring wheat (*Triticum aestivum* L.). *Crop Sci.* 12: 731–733.

Zarei L, Cheghamirza K and Farshadfar E (2013) Evaluation of grain yield and some agronomic characters in durum wheat (Triticum turgidum L.) under rainfed conditions. *Australian Journal of Crop Science*, *7*(5): 609-617.

Zarkti H, Ouabbou H, Udupa SM, Gaboun F and Hilali A (2012) Agro-morphological variability in durum wheat landraces of Morocco.