# VARIABILITY AND ASSOCIATION OF SOME CHARACTERS WITH YIELD IN SHALLOT *(Allium cepa* var. *Aggregatum Don*.)

**M.Sc THESIS**

**BY**

**AWALE DEGEWIONE SHARDON**

**March, 2011**

**Jimma University**

# VARIABILITY AND ASSOCIATION OF SOME CHARACTERS WITH YIELD IN SHALLOT *(Allium cepa* var. *Aggregatum* Don.)

**M.Sc Thesis**

**Submitted to the School of Graduate Studies Jimma University, College of Agriculture and Veterinary Medicine**

**In Partial Fulfillment of the Requirements for the DEGREE OF MASTER OF SCIENCE IN HORTICULTURE (VEGETABLE SCIENCE)**

**By**

**Awale Degewione Shardon**

**March, 2011**

**Jimma University**

## SCHOOL OF GRADUATE STUDIES

## JIMMA UNIVERISITY COLLEGE OF AGRICULTURE AND VETERINARY MEDICINE

As thesis research advisors we hereby certify that we have read and evaluated the thesis prepared under our direction by **Awale Degewione Shardon**, entitled "**Variability and Association of some Characters with Yield in Shallot (*Allium cepa* var. *Aggregatum* Don.).**" We recommend that it be accepted as fulfilling the thesis requirements.

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As members of the examining board of the final M.Sc. thesis Open Defense Examination, we certify that we have read and evaluated the thesis prepared by Awale Degewione Shardon and examined the candidate. We recommended that the thesis be submitted as fulfilling the thesis requirements for the Degree of Master of Science in Horticulture (Vegetable Science).

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| External examiner | Signature | Date |

# DEDICATION

I dedicated this thesis manuscript to my grand father **ASSOWE SHARDON**, who devoted to bring me to this level from my early childhood.

# STATEMENT OF THE AUTHOR

First, I declare that this thesis is my bonafide work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for an advanced M.Sc degree at the Jimma University, College of Agriculture and Veterinary Medicine and is deposited at the University Library to be made available to borrowers under the rules of the Library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

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# BIOGRAPHICAL SKETCH

Awale Degewione Shardon was born in October 12, 1977 in Afdem warada, Shinille Zone, Eastern Somali Region, Ethiopia. From 1989 to 1995, he attended Elementary School at Afdem Elementary School. He also attended Junior Secondary and High School between 1996 and 1997, and 2001, respectively, both in Dire Dawa.

In 2002, he joined Jimma University, College of Agriculture and Veterinary Medicine and graduated with B.Sc. degree in horticulture in 2005. In the same year, he was employed by Somali Region Pastoral and Agro-pastoral Research Institute (SoRPARI) in Dryland Crop Research Division and worked as senior researcher until he rejoined the School of Graduate Studies at Jimma University, College of Agriculture and Veterinary Medicine in 2008.

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| ANOVA | Analysis of Variance |
| CA | Cluster Analysis |
| CSA | Central Statistical Authority |
| CV | Coefficient of Variation |
| DAP | Diammonium Phosphate |
| DNA | Deoxyribonucleic Acid |
| DZARC | Debre-Zeit Agricultural Research Center |
| GA | Genetic Advance |
| GCV | Genotypic Coefficient of Variation |
| GLM | General linear model |
| $H^2$ | Heritability in broad sense |
| IPGRI | International Plant Genetic Resource Institute |
| K | Selection differential |
| LSD | Least Significant Difference |
| m.a.s.l. | Meters above sea level |
| MoARD | Ministry of Agriculture and Rural Development |
| PCA | Principal Component Analysis |
| PCV | Phenotypic Coefficient of Variation |
| RCBD | Randomized Complete Block Design |
| RCBP | Rural Capacity Building Project |
| SAS | Statistical Analysis System |
| SoRPARI | Somali Region Pastoral and Agro-pastoral Research Institute |
| TSC | Total sugar content |

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# VARIABILITY AND ASSOCIATION OF SOME CHARACTERS WITH YIELD IN SHALLOT (*Allium cepa* var. *Aggregatum* Don.)

## ABSTRACT

*Shallot is used to be and indispensable crop used as condiment, cash source, and medicinal plant.Information about genetic variability and knowledge of quantitative characters with yield and among themselves is important for improvement of the crop through breeding; however, there is little information for genetic variability of different shallot accessions in Ethiopia using quantitative and qualitative traits. Forty nine shallot accessions were tested in a 7x7 simple lattice design at Debre-Zeit Agricultural Research Center in 2009/10. The over all objective was to study the extent of genetic variation and association among bulb yield and bulb yield related traits. The accessions differ significantly for most of the characters and relatively wide range of the mean for most of characters indicated the existence of variation among the tested accessions. High phenotypic coefficient of variation (PCV) and genotypic coefficient variation (GCV) were recorded for leaf diameter and percentage of bulb sprouting. High GCV along with high heritability and genetic advance was obtained from leaf diameter and percentage of bulb sprouting. Bulb yield was positively and significantly associated with plant height, leaf length, leaf sheath length, leaf sheath diameter, bulb length, bulb diameter, bulb dry weight, biological yield per plant, and marketable yield per plant at both phenotypic and genotypic levels. Path-coefficient analysis revealed that bulb dry weight exerted maximum positive direct effect on bulb yield followed by leaf length, leaf sheath diameter, and number of bulb splits per plant. $D^2$ analysis showed the 49 shallot accessions grouped into six clusters. This makes the accessions to become moderately divergent. Principal component analysis showed that the first six principal components explained about 76.15% of the total variation. The phenotypic diversity index for qualitative traits were (H'=0.58) for leaf color, (H'=0.47) for foliage attitude, (H'=0.36) for both leaf cross section and bulb skin color each revealed high diversity. Whereas, bulb shape (H'=0.07) showed the lowest diversity. From the result of this study, it could be concluded that BDW and LL can be considered for selection.*