

Inheritance of Seed Shape in Chickpea (*Cicer Arietinum L.*)



Botany

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Meena, H.P.

Scientist (Plant Breeding), Directorate of Oilseeds Research, Rajendranagar, Hyderabad-500030

Kumar, J.

Principal Scientist, Pulse laboratory, Division of Genetics, Indian Agricultural Research Institute, New Delhi-110012

ABSTRACT

Inheritance of seed shape in chickpea (Cicer arietinum L.) was studied during years 2007-08 to 2009-10. The materials used were four genotypes two desi and two kabuli types. The desi genotypes were Pusa-362 and JG-62 and kabuli types were Pusa-1088 and BG-1073. The crosses were attempted between desi and kabuli types as Pusa-362 x Pusa-1088 and JG-62 x BG-1073. The data in F₂ populations revealed that desi types are dominant over kabuli types. The segregation in F₂ populations indicates the monogenic inheritance of desi and kabuli type seeds.

Introduction

Chickpea [*Cicer arietinum* (L.)] is an important legume crop in the Semi-Arid Tropics (SAT) and the West Asia and North Africa (WANA) regions. Chickpea belongs to genus *Cicer*, tribe Cicereae, family Fabaceae, and subfamily Papilionaceae. It originated in south-eastern Turkey (Ladizinsky 1975). It is cultivated on 11, 51, 78,345 hectares in the world with 96, 85, 967 tonnes of production (FAOSTAT data 2009). About 97% of the chickpea area is in developing countries, where it is largely grown under marginal conditions under moisture stress. In India the total area under chickpea production is 7.58 million hectares with production of 6.91 million tonnes ([http://agricoop.nic.in/Agriculture statistics at a glance 2008. htm](http://agricoop.nic.in/Agriculture%20statistics%20at%20a%20glance%202008.htm)). In Asia, India accounts for 65.3% of the area and 67.2% of the production. Other important Asian countries such as Iran, Myanmar, Pakistan, and Turkey account for about 23% of the area and 20% of the production. The productivity in these countries ranges from 0.41 t/ha in Iran to 1.10 t/ha in Myanmar. There are two distinct types of chickpea cultivated in the world which are based on seed shapes, the angular (desi type) being the most common, followed by owl's head shape (kabuli type). The manner of seed use for different purposes varies with seed traits specially seed shape.

Materials and methods

The present investigation was conducted during the years 2007-08 to 2009-10 at Division of Genetics, IARI, New Delhi. The materials used were four genotypes two *desi* and two *kabuli* types selected from the chickpea breeding programme of Genetics Division. These lines were having variability for different seed shapes. The *desi* genotypes were Pusa-362 and JG 62 and *kabuli* types were Pusa 1088 and BG-1073. The crosses were attempted between *desi* and *kabuli* types as Pusa 362 x Pusa 1088 and JG 62 x BG-1073. The standard cultural practices were followed to raise a good crop. Emasculatation and pollination were done following conventional methods. The F₁ seed along with parents were sown during 2007-08. The seeds from all the parents and F₁ plants were collected at maturity. The seeds from each F₁ plant were critically examined for seed shape and the data were recorded on individual plant basis. In *rabi*, 2009-10 the F₂ generations were planted at IARI farm. The F₃ seeds from individual F₂ plants were collected and examined critically for seed shape. The data were

recorded on individual plant basis. The segregation for seed shape was analyzed by X² test to determine the goodness of fit of the observed segregation with expected ratios.

Results and discussion

The inheritance pattern of seed type in chickpea was studied in crosses involving desi and kabuli type parents which are presented as follows. The crosses were made among two desi (Pusa-362 and JG-62) and two kabuli (Pusa-1088 and BG-1073) parents. The F₁ plants produced seeds having desi types in all the crosses indicating the dominance of desi over kabuli types. The F₂ populations of these crosses segregated into 3 desi: 1 kabuli ratio (Table 1). The X² analysis showed that segregation in all crosses were in agreement with the expectation of 3:1 ratio (X² =0.338 and 0.397 P =0.561 and 0.528). These results indicate the monogenic inheritance of desi vs kabuli chickpea. Kumar et al. (1985) observed similar results in desi ´ kabuli crosses. Knights (1980), Hawtin and Singh (1980) also conducted similar experiments but most of them presented results in percentage of different seed shapes in F₂ and no conclusion were drawn regarding mode of inheritance. Meena et al. (2004) studied seed shape inheritance using three seed types and found digenic inheritance. This report also showed dominance of desi over kabuli types. Generally, desi type seeds are more common and wide spread than kabuli types therefore; desi seeds may have wild/normal alleles and show dominance over kabuli types as wild type traits generally show dominance. In the present investigation on inheritance of seed shape, desi and kabuli types were found to differentiate by one gene Based on these observations, the genetic constitution of desi and kabuli types is suggested as DD and dd respectively.

Table 1. F₂ segregation for seed type in desi vs kabuli chickpea crosses

Cross	F ₁ phenotype	F ₂ segregation		d.f.	X ² (3:1)	P
		Desi	Kabuli			
Desi ´ Kabuli						
Pusa-362 x Pusa-1088	Desi	110	32	1	0.338	0.561
JG-62 x BG-1073	Desi	146	43	1	0.397	0.528

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