Few interesting gigas mutants isolated from mutagenized m_2 population of chickpea (Cultivar- Vijay)

[1] Prajwal Bogawar, [2] Shivdas Aher, [3] Deepak Koche, [4] Archana Joshi-Saha

[1, 2, 3] Department of Botany, Shri Shivaji College of Arts, Com. & Science, Akola, Maharashtra, India.

[4] Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Center, Mumbai, Maharashtra, India

Abstract

Gigas mutants are phenotypically dominant mutant plants with vigorous vegetative growth over control. From mutagenized M2 population of chickpea (cultivar- Vijay) 04 gigas mutants were isolated. All the isolated gigas were with elongated, rigid stem, larger and broader leaflets and 02 with extensive hairs on leaf and stem surface. However, their flowering tendencies are found to be altogether different. Off these one was sterile, one showed normal flowering with control, one was late flowering and one was early flowering gigas. The mutagens might have alter the sequence of GIGAS gene which controls the FT gene family in most of the Chickpea germplasm. Pleiotropism recessive gene might be a cause of altered flowering tendencies in mutants.

Keywords: Chickpea, Gigas, Mutants, Pleiotropism

1. Introduction

Chickpea (*Cicer arietinum* L.) is the second largest grown food legume of the world [1]. It is self-pollinating and possesses limited variability. Consequently, the extent to which chickpea cultivars may be improved through conventional breeding method is limited. Mutation breeding supplement conventional plant breeding as a source of increasing variability and could confer specific improvement without significantly altering its acceptable phenotype [2]. It has been demonstrated by many workers that genetic variability for several desired characters can be induced successfully through mutations and its practical value in plant improvement programme has been well established. Main advantage of mutation breeding is the possibility of improving one or two characters without changing the rest of the genotype. However, all the changes caused by mutagens are not having the economic benefit; some of them are merely visual parameters for identifying the effectivity of mutagen and its dose. Induced mutagenesis has contributed to the identification variable mutants with both economic and academic interests [3]. The present paper deals with some uncommon variations especially Gigas of academic interest induced by gamma radiations and EMS in Chickpea cultivars –Vijay, isolated from M_2 population.

2. Materials and methods

Germplasm of Chickpea, cultivar- Vijay was procured from Mahatma Phule Agricultural University Rahuri (MS). The dried, healthy seeds with 10-12% moisture content were irradiated with gamma rays with dose of 300, 400 and 500 Grey and 0.2, 0.3 and 0.4% EMS. For each dose about 150 g of seeds of each variety was taken. The gamma ray (GR) irradiation facility (Co^{60} source) was made available from Bhabha Atomic Research Center, Trombay, Mumbai. The treated seeds were sown in October 2016 under field conditions at Departmental field of Shri Shivaji College, Akola (MS) with spacing 15 cm within row and 30 cm between row to raise M_1 plants. The M_1 plants were harvested individually and sown in October 2017 to raise M_2 plant to row progenies. The untreated control was sown on either side of each plot.

3. Results and discussion

Table 1: Number of gigas isolated from respective doses of M_2 population of Chickpea

Treatment/ Dose	Total M2 Population	Gigas mutants Isolated
GR 300 Grey	7380	03
EMS 0.2%	1480	01

Fig-1: Gigas mutants of Chickpea isolated from M2 population: A: Late flowering, B: Flowering with control, C: Non flowering (sterile), D: Early flowering

From M_2 population of cultivar Vijay- four gigas mutant plant types were isolated; three from 300 Grey dose and one from 0.2% EMS (Table-1). All gigas have dominant phenotypic appearance with 1.5 times more height than control with elongated, rigid stem and larger and broader leaflets. The gamma irradiated mutants showed circinate vernation in growing apcal branches and leaves were slight thick and hairy surface while EMS gigas was with less primary braches and smooth larger leaves (Fig. 1). Out of these one from 300 Grey dose was sterile while other three were with flowers and pods. But out of these three one flowers with control, one showed late flowering and one gigas (EMS 0.2%) showed 10 day early flowering. The pod size of fertile gagas was double than that of control. Earlier gigas were reported in few case of mutation breeding in Chickpea. Davis *et al.* [4] reported that it might be pleiotropic effect of single recessive gene. Similar gigas were reported by Barshile and Apparao [5] and Barshile [6]. Beveridge and Merfet [7] suggested that, in pea plants gagas mutants does not have flower stimulus. As all the mutants were of same cultivars and cultivated in same field, environmental impact on all plants of the field was same. However, variation in habit and flowering tendency might be mutagen and dose dependent [8-9]. Probably, the cascade of flowering gene might have block in sterile mutant gigas. While the response was delayed by flowering genes in late flowering gigas. In case of early flowering gigas, it might have two independent mutations, one affecting phenotype and other to flowering of plant. The classical genetic analyses have distinguished four Mendelian loci, named *Early flowering* 1 (*Efl1*) to *Efl4* [9] at FT gene family. Recessive alleles at these loci confer early flowering and at least two are likely to be widespread within the chickpea germplasm and have a major impact on flowering time adaptation.

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5. References

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