



Research article

Characterization of qualitative traits of germplasm in chickpea (*cicer arietinum* L.)

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ABSTRACT

Chickpea has low genetic base but spectrum of variability is a key factor behind a successful breeding programme. New recombinants can be generated through crossing between diverse parents and wild types. This study was aimed to classify chickpea germplasm into various categories as per guidelines provides in chickpea descriptor and on the basis of range of variation which could be useful to develop desirable breeding lines. Three hundred genetically diverse germplasm were grown in randomized complete block design with two replications. Nine qualitative traits during *spring* 2010-11 were observed and recorded. Categorization of germplasm for traits was done by using guideline of International Chickpea descriptor. Three hundred germplasm obtained from NBPGR in qualitative traits were evaluated for remarkable variations. Remarkable variations with other traits have identified new variability in germplasm such as presence of high stem pigmentation, small leaflet size, white-pink striped flower colour, erect growth habit and rough seed surface in germplasm. Remarkable variations were observed in nine qualitative traits. Similarly wide range of variations identified in nine qualitative traits.

Keywords: Medicinal plant, Germplasm, genetic diversity, traits, anthocyanin.

INTRODUCTION

Chickpea commonly known as gram or Bengal gram belongs to order Fabales, family Fabaceae and sub family Faboideae. The genus *Cicer* comprises 43 species which shares 42 wild (34 perennials and 8 annuals) and 1 cultivated species *Cicer arietinum* L. Vavilov (1926) suggested South-west Asia and Mediterranean region as the primary centre of origin and Ethiopia as the secondary centre. Breeding new plant type is possible through various breeding method but selection of new plant type and recombination depends upon diverse genetic variability. The advantageous approach is to bring together the geographical genetic diversity, because this will combine diverse gene pool together and create new recombination of desirable gene which may produce new plant type ^[1].

Germplasm is basic material with a plant breeder to initiate desirable breeding programme. Germplasm consists of genetic variability for quantitative and qualitative traits. The first and foremost

step in any crop improvement programme is the evaluation and characterization of the available germplasm.

Experimental details

MATERIAL AND METHOD

The present investigation was carried out during spring 2010-11 at research field of R.A.K. college of Agriculture, Sehore (M.P.). Sehore is situated in the western part of the Vindhyanal plateau in sub-tropical zone at the 27°12' north latitude and 77°05' east longitudes at an altitude of 498.77 m above mean sea level. The soil of the field is clay loam vertisol with 52% clay, 41.3% silt and 6.6% sand with pH ranging from 7.2 to 7.8. The experimental material consisted of three hundred germplasm of chickpea obtained from NBPGR, New Delhi. Based on seed shape, size and colour, cultivated chickpeas are of two types (Cubero 1975).

Kabuli type: The seeds of this type are large (100-seed mass >25 g), owl's head seed shape, and cream-coloured. The plant was

medium to tall in height, with large leaflets and white flowers, and contains no anthocyanin [2].

Desi type: The seeds of this type are small and angular in shape. The seed colour varies from cream, black, brown, yellow to green. The plant was short with small leaflets and purplish flowers, and contains anthocyanin.

Three hundred germplasm were grown in RBD design with 2 replications during spring 2010-11. Each entry was sown in 4 meter long row with 30 cm row-to-row spacing.

Observations on qualitative traits were recorded on the basis of individual lines performance.

Qualitative traits

Early plant vigour: Low or Medium or High

Stem pigmentation: Absent or Low or High

Leaflet size: Small or Medium or Large

Flower colour: Blue or Pink or White or White pink striped

No. of flowers per node: Single or Twin or Multiple

Plant growth habit: Erect or Semi-erector Semi-spreading or Spreading or Prostrate

Seed colour: Brown or yellow or orange or green or White

Seed shape: Angular or Owl's head or Pea shaped

Seed surface: Smooth or Rough or Tuberculated [4].

RESULT

The present investigation was targeted to assess remarkable variations identified in germplasm for qualitative traits. Observation on nine qualitative traits was recorded in the present investigation.

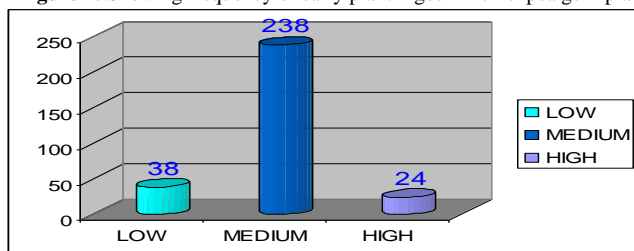
Qualitative traits

Total three hundred germplasm were evaluated and their relative frequencies & percentage for qualitative traits were recorded. The frequency and relative percentage of different germplasm for nine qualitative traits has been presented in Table-1 and Fig. 1-9.

Early plant vigour

Chickpea accession was classified as low, medium and high plant vigour. Maximum number of 238 genotypes (79.33%) was recorded in the medium early plant vigour category followed by 38 genotypes (12.66%) berried was low early plant vigour and only 24 genotypes (8.0%) were having high early plant vigour category. (Table 1 & Figure 1)

Figure 1: Showing frequency of early plant vigour in chickpea germplasm

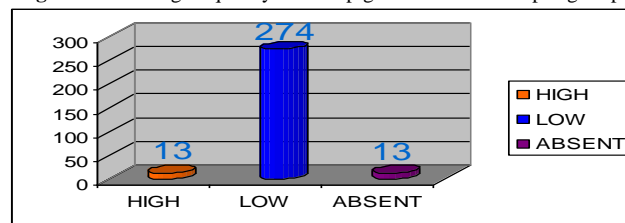


Stem pigmentation

Pigmentation in leaves and stem was recorded in three

categories viz., low, high and absent after 30 days of sowing. Maximum numbers of 274 genotypes (91.33%) were in low pigmentation category and 13 genotypes (4.33%) did not show any pigmentation while 13 genotypes (4.33) showed high pigmentation in germplasm investigation. (Table 1 & Figure. 2)

Figure 2: Showing frequency of stem pigmentation in chickpea germplasm

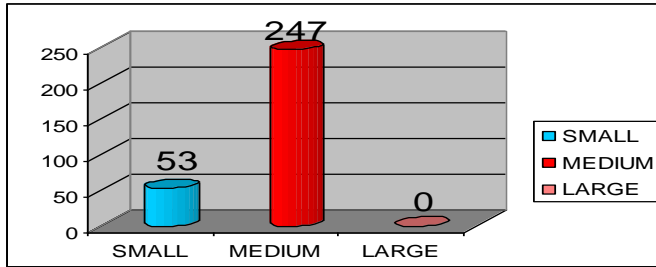


Leaflet size

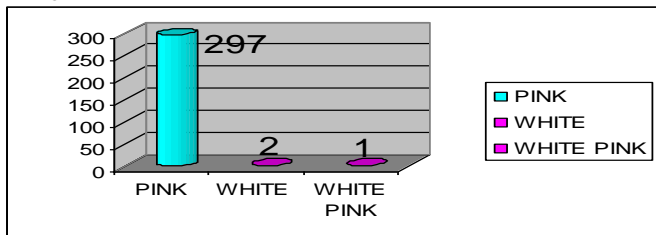
Leaflet size was measured after 35 days of sowing and categorized as small, medium and large size. Highest numbers of 247 genotypes (82.33%) were observed in medium leaflet size category. Having leaflet length between 10-15mm and width 4-12mm, followed by 53 genotypes (17.66%) in small type having leaflet length less than 10mm and width less than 3mm. But none of the genotypes present in large leaflet size group. (Table 1 & Figure 3)

Table 1: Relative frequency and percentage of different qualitative traits in three hundred germplasm of chickpea (*cicer arietinum* L.)

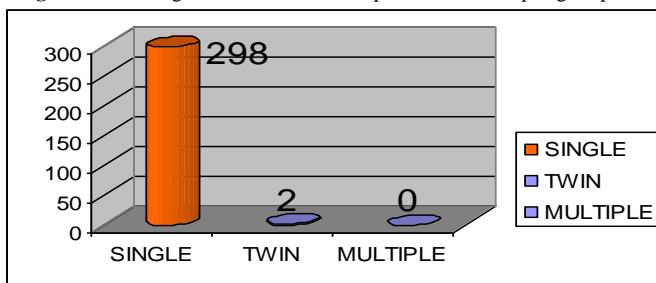
| Qualitative Traits | Type of traits | Germplasm | |
|----------------------------|--------------------|------------|------------|
| | | Freq uency | Percentage |
| Early plant vigour | Low | 38 | 12.66% |
| | Medium | 238 | 79.33% |
| | High | 24 | 8.0% |
| Stem pigmentation | High | 13 | 4.33% |
| | Low | 274 | 91.33% |
| | Absent | 13 | 4.33% |
| Leaflet size | Small | 53 | 17.66% |
| | Medium | 247 | 82.33% |
| | Large | Nil | 0% |
| Flower colour | Blue | Nil | 0% |
| | Pink | 297 | 99.0% |
| | White | 2 | 0.66% |
| | White pink striped | 1 | 0.33% |
| Number of flowers per node | Single | 298 | 99.33% |
| | Twin | 2 | 0.66% |
| | Multiple | Nil | 0% |
| Plant growth habit | Erect | 12 | 4% |
| | Semi-erect | 60 | 20% |
| | Semi-spreading | 210 | 70% |
| | Spreading | 18 | 6% |
| | Prostrate | Nil | 0% |
| Seed colour | Brown | 12 | 4.0% |
| | Yellow | 288 | 96.0% |
| Seed shape | Angular | 270 | 90.0% |
| | Owl's head | 30 | 10.0% |
| | Pea | Nil | 0% |
| Seed surfaces | Smooth | 221 | 73.66% |
| | Rough | 79 | 26.33% |
| | Tuberculated | Nil | 0% |

Figure 3: Showing frequency of leaflet size in chickpea germplasm**Flower colour**

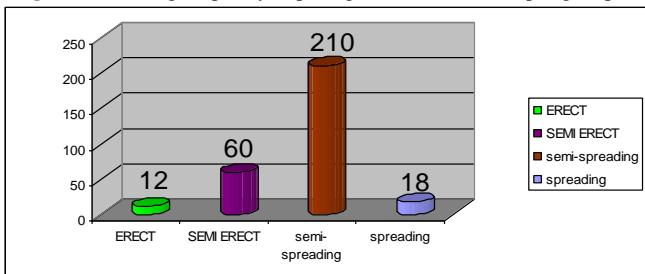
Flower colour viz.: blue, pink, white and white pink were measured at the flowering stage of the crop. Maximum numbers of 297 genotypes (99.0%) were having pink colour flowers, followed by 2 genotypes (0.6%) having white flower colour and 1 genotype (0.3%) having white pink striped flower colour. (Table 1 & Figure 4)

Figure 4: Showing frequency of flower colour in chickpea germplasm**Number of flowers per node**

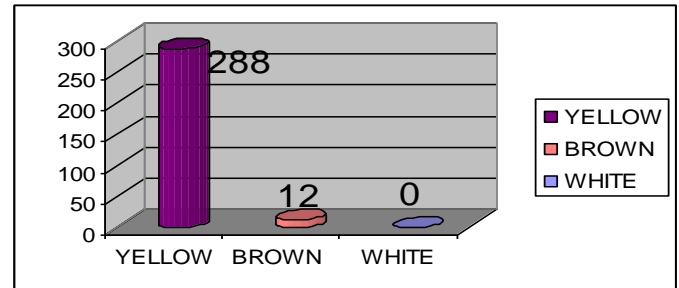
Number of flowers per nodes were measured and classified as single, twin and multiple flowers types. Maximum 298 genotypes (99.33%) showed single flower per node and 2 genotypes (0.66%) were of twin flower per node recorded. (Table 1 and Figure 5)

Figure 5: Showing of number of flowers per node in chickpea germplasm**Plant growth habit**

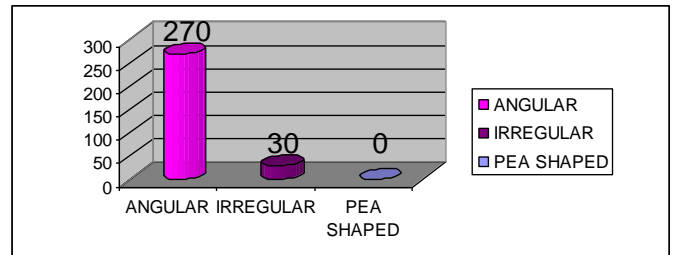
The frequency distribution of chickpea accessions for plant growth habit is presented. Maximum numbers of 210 genotypes (70.0%) were observed of semi-spreading type followed by 60 genotypes (20.0%) of semi erect type, 18 genotypes (6.0%) of spreading type and 12 genotypes (4.0%) of erect types. (Table 1 & Figure 6)

Figure 6: Showing frequency of plant growth habit in chickpea germplasm**Seed colour**

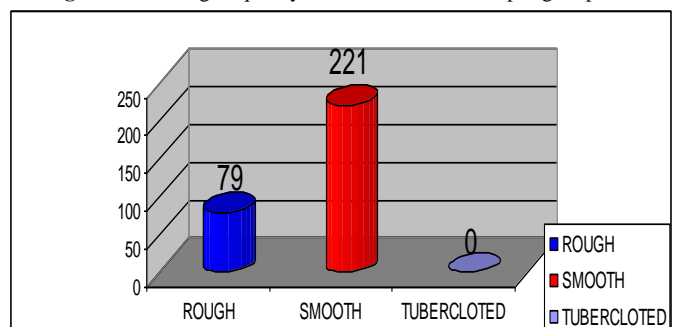
Seed colour was recorded after 20 days of crop harvesting. It was categorized as, brown and yellow, Highest number of 288 (96.0%) were yellow seeded genotypes followed by 12 brown seed colour genotype (4.0%). (Table 1 & Figure 7)

Figure 7: Showing frequency of seed colour chickpea germplasm**Seed shape**

The studied accessions were classified as angular ram's head (*desi*), irregular rounded owl's head (*kabuli*) and pea shaped (*gulabi*) categories. Amongst the investigated 300 genotypes maximum 270 genotypes (90.0%) were found in angular ram's shape type, 30 accessions (10.0%). (Table 1 & Figure 8)

Figure 8: Showing frequency of seed shape in chickpea germplasm**Seed surface**

Seed surface was visually recorded and classified as rough and smooth category. Maximum number of 221 genotypes (73.66%) showed smooth seed surface and 79 genotypes (26.33%) were having rough seed surface. (Table 1 & Figure 9)

Figure 9: Showing frequency of seed surface in chickpea germplasm**CONCLUSION**

Germplasm have generated remarkable variability and useful traits.

08.0% germplasm identified having high early plant vigour which was show early variety.

Small leaflet size was recorded which helps in low transpiration that's result drought tolerance.

Erect plant growth habit was recorded which is fit for mechanical harvesting.

26.33% germplasm identified having rough seed surface which was good for pod borer.

Remarkable good traits were identified in germplasm and these traits could be utilized in the development of new plant type of chickpea.

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