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INHERITANCE OF FRUIT COLOUR IN NORMAL AND IRRADIATED PROGENIES OF BRINJAL

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Fruit colour in brinjal is an important factor that influence market preferences. Usually bright deep purple colour is preferred over green, white or variegated types. It is necessary to understand the inheritance of this character for breeding brinjal varieties possessing the desired fruit colour. The present study was undertaken at the College of Agriculture, Vellayani during 1976–78 to elucidate the genetic basts of four fruit colours in brinjal, namely, mottled purple, mottled green and white.

Bailey (1892) found that hybrids of white fruited and dark purple fruited parents had purple fruits with lighter apex. Halstead (1918) reported that the purplecolour is dominant to white.

Tatebe (1 944) reporting the inheritance of fruit colour stated that the purple colour was dominant over green variegated and that green variegated in turn was dominant over white. Pal and singh (1946) and Janick and Topoleski (1963) recorded that F_1 from a cross between purple and gteen was of intermediate nature with respect to colour. Nolla (1961) reported that red, purple and pink fruit colour. were dominant over green, Choudhuri (1977) proposed a simple dominant recessive relationship between green stripe and white colour, based on his studies involving west African egg plant varieties.

Materials and Methods

A cultivated brinjal variety (Purple giant) with very large deep purple fruits and a wild variety (*Solanum melongena* var, *insanum* Prain) producing very small green mottled fruits (green stripes over white background) were selected for the studies. The varieties were crossed with *S. melongena* var *insanum* as the female parent. The genuine hybrids were identified and self pollinated. The F_2 generation was raised and classified on the basis of the fruit colour.

Part of the F_1 seeds were subjected to *gamma* irradiation from Co 60 source at the LD 50 dose of 25 KR. The parents and F_1 M_1 generations were grown and the F_1 M_1 mutants for fruit colour were isolated. The selfed seeds from the F_1 M_1 fruit colour mutants namely mottled green, purple and white were grown into F_2 M_2 populations and the segregation pattern of the fruit colour was studied.

Results and Discussion

The data collected from progeny analysis in the F_1, F_2, F_1 M_1 and F_2 M_2 generations following the cross between varieties *S.melongena* var. *insanum* and purple giant are presented in Table 1.

The selfed progeny of either of the parents was uniform in respect of fruit colour indicating that the parental varieties were pure breeding. The pattern and intensity of pigmentation in the F_1 plants (mottled purple) indicated that this phenotype is the result of an added effect of the two parental colour patterns. The F_2 generation consisted offour colour types, namely, mottled purple, mottled green and white. The frequencies in these phenotypic classes fitted very well with the dihybrid ratio of 9:3:3:1 with a p value greater than 0.99 (Table 2). The F_1 and F_2 observations thus indicate that the fruit colour in the two parental varieties is gover. ned by two independently inherited genes, i.e, purple (P-p) and mottled green (G-g) Thus (PPgg) represents the purple parent and (PPGG) represents the mottled green parent. The mottled purple phenotype in the F_1 will be (PPGg). The double recessive genotype (ppgg) will then produce the white fruit colour. The present results are in agreement with the reports of Halstead (1918) that purple colour is dominant over white and that of Tatabe (1944) and Choudhuri (1977) that green stripe is simple dominant over white.

The observations in the F_1 M_1 generation lend further support for this hypothesis of digenic inheritance. The appearnace of purple, mottled green and white mutants in the F_1 M_1 generation could be explained as due to independent mutations induced by irradiation at either or both of the two genetic loci. The mottled purple F_1 (PpGg) can change to mottled green (PPGg) through mutation of P to p to purple (PPgg) through mutation of G to g and to white (ppgg) through mutation at both the loci simultaneously but quite independently. The low freque-ncies for the three colour mutant types in the F_1 M_1 generation substantiate the above hypothesis.

The colour pattern in the F_2M_2 progenies derived from the F_1M_1 mutants substantiate the two gene mechanism for inheritance of fruit colour. The F_1M_1 mottled green mutant segregated in the F_2M_2 into mottled green and white. whereas the F_1M_1 purple mutant produced only purple individuals in the progeny. Both these F_1M_1 mutants are expected to give *25%* white fruited plants in the F_2M_2. The low or nil frequency for white fruited plants might be due to the semi sterile nature of the F_1M_1 mutants and small size of the F_2M_2 progenies in either of the cases The F_1M_1 white mutant bred true in the F_2M_2 confirming the double homozygous recessive genotype assigned to it.

The dihybrid ratio obtained in the F_2, the appearance of all the three possible colour mutants in the F_1M_1 and the breeding behaviour of the mutants in the F_2M_2 indicate that the inheritance of fruit colour in the two brinjal varieties is controlled by two genes segregating independently. The genotypes for the different colour types suggested are:

Var. *insanum* (mottled green)	pp GG
Var. purple giant (purple)	PP gg
F_1 (mottled purple)	Pp Gg
F_2 (mottled purple)	PP GG or Pp GG or PP Gg or Pp Gg
F_2 (purple)	PP gg or Pp gg
F_2 (mottled green)	pp GG or pp Gg
F_2 (white)	pp gg
F_1M_1 (mottled purple)	Pp Gg
F_1M_1 (purple mutant)	PP gg
F_1M_1 (mottled green mutant)	pp Gg
F_1M_1 (white mutant)	pp gg

Table 1

Inheritance of fruit colour in the F_1, F_2, F, M_1 and F_2 M_2 populations of brinjal

Sl. No.	Type of population	Total of Plants	No. of plants under each fruit colour group			
			Mottled green	Pur-ple	Mottled purple	white
1	Var. *insanum* (female parent)	60	60	...	...	...
2	Var. purple giant (female parent)	60	...	60	...	...
3	F_1 generation	120	...	...	120	...
4	F_2 generation	65	12	12	37	4
5	F_1 M, generation	190	14	12	160	4
6	F_2M_2 from F_1M_1 mottled green mutants.	20	18	...	...	2
7	F_2 M_2 from F_1 M, purple mutants	30	...	30	...	...
8	F_2 M_2 from F_1 M_1 white mutants	56	...	...	...	56

Table 2

Goodness of fit of the F_2 segregation

Phenotype	Observed frequency	Expected frequency (9:3 3:1)	d	d^2	d^2/e
1 Mottled purple	37	36.56	0.44	0.190	0,005
2 Purple	12	12 19	-0.19	0,036	0.002
3 Mottled green	12	12.19	–0.19	0 036	0.002
4 White	4	4.06	–0.06	0.0036	0.0009
Total	65	65	0	0,2656	0.0099

X^2 for 3 d.f, = 0.0099

p = for X^2 = 0.0099 is > 0.99

Summary

The inheritance of fruit colour in brinja! *(Solarium melongena)* was studied by analysing the progeny belonging to the F, M_2, F_1M_1, and F_2M_2 generations resulting from a cross between varieties *insanum* and purple giant followed *by gamma* irradiation. The F_2 phenotypic frequencies fitted very well with the dihybrid ratio indicating that the fruit colour is governed by two independently inherited genes. Three colour mutants, namely, purple, mottled green and white were induced in the F_1M_1 generation by the irradiation. The appearance of these mutants is explained as due to independent mutations at either or both of the two genetic loci. The colour pattern in the F_2M_2 progenies derived from the F_1M_1 mutants substantiates the two gene mechanism for the inheritance of fruit colour. The genotypes for the different colour types in the F_1, F, and F_1M_1 mutants have been indicated and discussed.

സംഗ്രഹം

'ഇൻസാനം' എന്നറിയപ്പെടുന്ന ഒരു വന്യ വഴുതിനയിനവും 'പർപ്പ്ൾ ജയന്റ്' എന്ന ഒരു കാർഷികയിനവും anമ്മിൽ സങ്കരണം rosrarrol F , F , F M , F M_2 എന്നീ തലമുറകളിലെ സന്തതികളുടെ കായ്നിറം പഠന വിധേയമാക്കി. F M go F M_2 ഉം തലമുറകൾ ഉൽപാദിപ്പിക്കാൻ വേണ്ടി F_1 വിത്തുകളെ ഗാമാവികിരണത്തിനു വിധേയമാക്കുകയുണ്ടായി. ഈ പഠനങ്ങളിൽ നിന്നും വഴുതിനയുടെ കായ്നിറത്തിനാധാരമായി രണ്ടു ജീനുകൾ ഉണ്ടെന്നു മനസ്സിലായി. F_1M_1 തലമുറയിൽ പർപ്പ്ൾ, പുള്ളിപ്പച്ച, വെള്ള എന്നീ മ്യൂട്ടന്റുകൾ പ്രത്യക്ഷപ്പെട്ടു. F_1M_1 മ്യൂട്ടന്റുകളുടെ അടുത്ത തലമുറ പരിശോധിച്ചതിൽ കായ്നിറത്തിനാധാരമായ ഇരട്ട ജീൻ സങ്കേതം ശരിയാണെന്നു തെളിഞ്ഞു. വ്യത്യസ്ത നിറങ്ങൾക്കാധാരമായ ജീന രൂപങ്ങൾ നിർദ്ദേശിക്കപ്പെട്ടു.

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