Indian J. Genet., 51 (4): 405–407 (1991)

GENETIC ANALYSIS OF ADHERENT SEEDLING LEAVES AND LAZY GROWTH HABIT IN *COIX* (MAYDEAE)

PANUGANTI N. RAO AND A. NIRMALA

Department of Botany, Andhra University, Visakhapatnam 530003

(Received: February 8, 1990; accepted: March 26, 1991)

ABSTRACT

The adherent seedling leaf mutation in *Coix aquatica* Roxb. and *C. gigantea* Koen., and lazy growth habit mutation in the latter species are under the control of recessive genes designated as adl and lah, respectively. The allele for adherence is common to both the species. In *C. gigantea*, adl and lah showed independent assortment.

Key words: *Coix gigantea*, *C. aquatica*, adherent seedling leaves, lazy growth habit, mutations, genetic analysis.

Although considerable cytological work has been done in different species of *Coix*, there is little information on the genetics of several morphological variants found in its populations. Earlier work pertaining to the genetic analysis of mutants is limited to (i) seedling base and style colour [1], gynoecious and male sterile phenotype [2] in *Coix aquatica* Roxb., (ii) solidity of fruit cases [3], seedling base and style colour [4, 5], leaf hairiness [5], and stylelessness [2] in *C. lacryma-jobi* L., and (iii) plastid mutations [6, 7] in these two species and in *C. gigantea* Koen.

Two morphological mutants, adherent seedling leaves in *C. aquatica* and *C. gigantea* and lazy growth habit in the latter, were isolated and their genetic behaviour is reported.

MATERIALS AND METHODS

Coix is monoecious and naturally cross pollinated. In the first selfed generation of *C. gigantea* obtained from the Western Ghats, adherent seedling leaves in one case, and lazy growth habit in another were found. Adherent phenotype was also located in one seedling in *C. aquatica* in the fifth selfed generation of a mixed population. Selfing of the mutants was done by enclosing the whole plant in a muslin bag. For genetic studies, crosses were made by enclosing the two parental plants in the same muslin bag with regular removal of staminate spikelets in the intended female parent so that crossed seed could be harvested

from the female plant. When the lazy phenotype was involved in crosses, it was invariably used as the female parent.

RESULTS

DESCRIPTION OF THE MUTANTS

Adherent seedling leaves. The distal portions of 1st–4th leaves were adherent and as the subsequent leaves started emerging, adherence became gradually free and further growth of the seedling was completely normal. Some variations in expression of the character were also found. In some only the first three leaves were adherent, in others only 2nd and 3rd leaves were involved, in some others the first three leaves in one group and the next three leaves in another group showed adherence, and rarely adherence persisted even after transplantation until the emergence of the 8th leaf and formation of one or two tillers.

Lazy growth habit. The growth of the primary culm and the first few tillers was normal until about the emergence of 10th leaf in the former. Subsequently, both the main and secondary culms took an angular curve and growth continued in a horizontal instead of erect manner. The same growth pattern occurred in the subsequent culms, also resulting in radial spread of the culms parallel to the soil. Such culms required some force to lift them. The distal portions of the culms, however, were somewhat recurved upwards and showed some ascendance in growth, as a consequence, the height of the plant from the ground taken at the highest point was less than 0.65 m while the normal plants grow to a height of 2.5–3.0 m. The culm length in the fully mature lazy plant varied from about 2.50 m (early culms) to 0.50 m (later culms). Variation in the expression of the lazy character in the segregating progeny was only in the extent of curvature of the main and early culms towards recumbent position.

INHERITANCE

Both adherent and lazy phenotypes behaved as monogenic recessives. In *C. aquatica*, the adherent mutant when selfed produced only adherent seedlings (122 seedlings). In normal x adherent crosses, all the 22 F_1 seedlings were normal, in F_2 123 normal and 31 adherent, and in the testcross progeny 82 normal and 67 adherent seedlings were obtained, giving a good fit to 3:1 ($P > 0.2$) and 1:1 ($P > 0.3$) ratios, respectively. In *C. gigantea* also, adherent plants produced only adherent seedlings on selfing (64 seedlings), the F_1s (34 seedlings) of the crosses between normal x adherent were normal, F_2 segregated into 42 normal and 11 adherent (3:1 ratio, $P > 0.2$), and testcross progeny into 22 normal and 19 adherent seedlings (1:1 ratio, $P > 0.5$). The allele is designated as adl.

Interspecific F_1 hybrids (14 seedlings, $2n = 15$) between the adherent mutants of *C. aquatica* ($n=5$) and *C. gigantea* ($n = 10$) were always adherent, which indicates that the adl allele is common to both species.

The lazy mutant (76 plants) of *C. gigantea* bred true. The 32 F_1 plants between lazy x normal had normal growth habit, while the F_2 progeny segregated in to 108 normal and 33 lazy (3:1 ratio, $P > 0.8$), and the testcross into 22 normal and 26 lazy plants (1:1 ratio, $P > 0.8$). The recessive gene is designated as lah.

In the study of combined segregations for both genes in the lazy x adherent crosses, the 98 F_1 plants were normal, and the F_2 and testcrosses segregated into (i) normal seedling leaves and normal habit, (ii) normal seedling leaves and lazy habit, (iii) adherent seedling leaves and normal habit, and (iv) adherent seedling leaves and lazy habit in 55, 24, 16 and 7 plants, and 18, 26, 17 and 21 plants, fitting to 9:3:3:1 ($P > 0.2$) and 1:1:1:1 ($P > 0.2$) ratios, respectively, showing independent assortment of the adl and lah genes.

Similar mutants were also reported in maize and the three-letter symbols for the proposed genes in this study are in accordance with the recommendations of the Burnham Committee [8].

REFERENCES

1. P. N. Rao. 1974. Inheritance in *Coix aquatica*. Indian J. Genet., **34**: 181–183.

2. J. Venkateswarlu and P. N. Rao. 1974. Genetic analysis of dioecy in *Coix*. Indian J. Genet., **34**: 54–56.

3. A. Yamamura. 1949. The genetics in the genus *Coix*. 1. Jap. J. Genet., **24**: 180–182.

4. M. Murakami. 1961. Studies on the breeding of genus *Coix*. V. Genetic segregation in F_2 generation beween Hatomugi (*Coix Ma-yuen* Roman) and Juzudama (*Coix lacryma-jobi* L.). Sci. Rep. Kyoto Prefectural Univ. Agric., **13**: 1–9.

5. J. Venkateswarlu and P. N. Rao. 1974. Inheritance of some qualitative characters in Job's tears. Indian J. Genet., **34**: 178–180.

6. P. N. Rao. 1974. *Albomaculata* type of variegation in *Coix*. Curr. Sci., **43**: 760–761.

7. P. N. Rao. 1975. Plastid inheritance in Job's tears, *Coix lacryma-jobi* L. Theor. Appl. Genet., **45**: 363–367.

8. E. H. Coe (Jr.) and M. G. Neuffer. 1976. The Genetics of Corn. *In*: Corn and Corn Improvement (ed. G. F. Sprague). American Society of Agronomy, Inc., Madison, Wisconsin, USA: 111–223.