Journal of Advance Multidisciplinary Research 2023; 2(1):19-20 ISSN NO: 2583-6854

Inheritance of traits in pearl millet (*Pennisetum Glaucum* L.)

Dr. R. K. Rathore
College of Agriculture, Sumerpur, Rajasthan, India
Correspondence Author: Dr. R. K. Rathore
Received 24 Feb 2023; Accepted 27 Mar 2023; Published 6 Apr 2023

Abstract
The inheritance of domestication traits distinguishing pearl millet (*Pennisetum glaucum*) was assessed from a cross between typical lines of pearl millet. Despite a high level of recombination between the two genomes, the existence of preferential associations between some characters was demonstrated leading in particular to cultivated-like phenotypes. Inheritance of characters involved at the spikelet level based on crosses involving morphologically differentiated cultivated forms and general inheritance trend for millet plant architecture traits. Traits determining spikelet structure showed simple Mendelian inheritance. In all crosses, pigmentation observed for node and leaf auricle, thus, present investigation reveals that nodal and leaf auricle pigmentation in pearl millet is controlled by one allelic gene pair (Varalakshmi *et al*. (2012).

Keywords: pearl millet, traits, inheritance, dominance, phenology, variation

Introduction
Pearl millet (*Pennisetum glaucum*) is a major staple cereal crop worldwide after rice, wheat, maize and sorghum. It can be grown on different ecologies of India, receiving rainfall above and below 400 mm (Yadav, O.P. *et al*., 2021) [4]. The inheritance pattern has been studied by previous workers for various traits like plant colour, seed colour and pigmented note and leaf auricle. However, the author could not come across any reference where inheritance pattern of these traits was reported. Hence, the present study was undertaken to investigate the inheritance pattern of plant colour, seed colour and pigmented note and auricle.

The different forms of pearl millet like *P. glaucum* ssp. *monodii* are only found in Africa, where they have been involved in the crop architecture for several thousand years (Brunken *et al*., 1977) [1]. Genetic modifications of some original traits define the genetic syndrome (Harlan, 1977) [1]. The most important transformations in pearl millet are the suppression of spikelet shedding, the size reduction of bristles and bracts leading to uncoated seed, the increase in seed size and spikelet pedicel length and the loss of dormancy. Regarding plant architecture and phenology, drastic changes are evidenced by the tillering habit (low number of tillers and hierarchy in the flowering of tillers) and spike length (gigantism), both resulting from an increase in apical dominance (Doebley *et al*., 1997) [3].

Materials and methods
For plant colour, the material consisted of one female (B25) having pale yellow plant type and seven different type of testers (four inbred testers (R1, R2, R3, R4) and 3 OPVs as tester (R5, R6, R7). Seven crosses (four single crosses and three top crosses) between these genotypes (B25 X R1, B25 X R2, B25 X R3, B25 X R4, B25 X R5, B25 X R6 and B25 X R7) were made during summer 2017-18 and their F1 progenies were raised subsequently at the farm of Sumerpur. Observations on dominance behavior of plant colour in F1 were recorded.

Result and discussion
Among four single crosses, three F1s (B25 X R1, B25 X R3 and B25 X R4) were found with pale yellow plant type and one (B25 X R2) with normal green plant type, whereas, among top crosses, one F1 (B25 X R6) was found with pale yellow plant type and two F1s (B25 X R5 and B25 X R7) were found with normal green plant type. Thus, present investigation reveals that pale yellow plant type in pearl millet is controlled by one allelic gene pair. However, some F1s were not found with pale yellow plant type, this means that there is need to further investigate these F1s which ever not found pale yellow plant type.

Table 1: Observations of F1s involving different type of testers for pale yellow plant type inheritance

Female code		Male code	Female trait	Male trait	F1 plant colour
B25	X	R1	Pale yellow plant type	Normal green	Pale yellow plant type
B25	X	R2	Pale yellow plant type	Normal green	Normal green
B25	X	R3	Pale yellow plant type	Normal green	Pale yellow plant type
B25	X	R4	Pale yellow plant type	Normal green	Pale yellow plant type
B25	X	R5	Pale yellow plant type	Normal green	Normal green
B25	X	R6	Pale yellow plant type	Normal green	Pale yellow plant type
B25	X	R7	Pale yellow plant type	Normal green	Normal green

For seed colour, during summer 2018, one female (B12) having pearly white seed colour crossed with grey coloured seven different types of testers (four inbred testers (R1, R2, R3 and R4) and 3 OPVs as tester (R5, R6, and R7). Seven F1s four single crosses and three top crosses (B12 X R1, B12 X R2, B12 X R3, B12 X R4, B12 X R5, B12 X R6 and B12 X R7). Among these, all single cross F1s were found with pearly white seed colour, while three top crosses were not found with pearly white seed. This reveals that pearly white seed colour is dominant over grey but if both the parents are inbreds. Also, we further need to investigate for top cross F1s which were not found pearly white seed colour.

Table 2: Observations of F1s involving different type of testers for seed colour inheritance

Female code		Male code	Female trait	Male trait	F1 Trait
B12	X	R1	White seeded	Grey seeded	White seeded
B12	X	R2	White seeded	Grey seeded	White seeded
B12	X	R3	White seeded	Grey seeded	White seeded
B12	X	R4	White seeded	Grey seeded	White seeded
B12	X	R5	White seeded	Grey seeded	Not white seeded
B12	X	R6	White seeded	Grey seeded	Not white seeded
B12	X	R7	White seeded	Grey seeded	Not white seeded

Summary and conclusion

For pigmented node and auricle, material consisted of one female (B6) having pigmented node and pigmented leaf auricle, were crossed with non-pigmented node and non-pigmented leaf auricle seven different types of testers (four inbred testers (R1, R2, R3 and R4) and 3 OPVs as tester (R5, R6, and R7). All seven F1s were raised during *Kharif 2018* at the farm of the Sumerpur. Observations on dominance behavior of pigmented node and leaf auricle were recorded in F1. In all the seven crosses, pigmentation observed for node and leaf auricle, thus, present investigation reveals that nodal and leaf auricle pigmentation in pearl millet is controlled by one allelic gene pair (Varalakshmi *et al*. (2012) [5].

Table 3: Observations of F1s involving different type of testers for pigmented node and leaf auricle inheritance

Female code		Male code	Female trait	Male trait	F1 Trait
B6	X	R1	Pigmented node and leaf auricle	Non-pigmented node and leaf auricle	Pigmented node and leaf auricle
B6	X	R2	Pigmented node and leaf auricle	Non-pigmented node and leaf auricle	Pigmented node and leaf auricle
B6	X	R3	Pigmented node and leaf auricle	Non-pigmented node and leaf auricle	Pigmented node and leaf auricle
B6	X	R4	Pigmented node and leaf auricle	Non-pigmented node and leaf auricle	Pigmented node and leaf auricle
B6	X	R5	Pigmented node and leaf auricle	Non-pigmented node and leaf auricle	Pigmented node and leaf auricle
B6	X	R6	Pigmented node and leaf auricle	Non-pigmented node and leaf auricle	Pigmented node and leaf auricle
B6	X	R7	Pigmented node and leaf auricle	Non-pigmented node and leaf auricle	Pigmented node and leaf auricle

Moreover, the genes encoding these traits mapped in a linkage group where quantitative trait loci for spike size and tillering habit were found. This linkage group could correspond to one of the two chromosome segments to be involved in the variation for spikelet structure in progenies from several crosses. Such evolutionary significance is very useful for genomic organization as well as its genetic resources enhancement.

References

1. Brunken J, Dewet JMJ, Harlan JR. The morphology and domestication of pearl millet. Econ Bot. 1977;31:163-174.
2. Harlan Jr. Crops and Man. AmericanSociety of Agronomy and crop science society of America, Madison, Wt, 1975.
3. Doebley J, Stec A, Hubbard L. The evolution of apical dominance. Nature. 1997;386:485-488.
4. Yadav OP, Gupta SK, Govindaraj Mahalingam, Sharma Rajan, Varshney Rajeev, Srivastava Rakesh, *et al*. Genetic Gains in Pearl Millet in India: Insights into Historic Breeding Strategies and Future Perspective. Frontiers in Plant Science, 2021, 12. https://10.3389/fpls.2021.645038.
5. Varalakshmi *et al*. Genetic architecture of purple pigmentation and tagging of some loci to SSR markers in pearl millet, Pennisetum glaucum (L.) R. Br. Genetics and Molecular Biology. 2012;35(1):106-118. https://sci-hub.se/10.1590/s1415-47572012005000022.