https://doi.org/10.29321/MAJ.10.A04887

CHLOROPHYLL DEFICIENCIES IN *PENNISETUM TYPHOIDES* (Stapf. & Hubbard.) THE PEARL MILLET *

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Chlorophyll deficiencies are a common occurrence in cereals. They have been noted in some millets, *Sorghum*[1], *Eleusine coracana*[2], *Setaria italica*[3] and *Paspalum scrobiculatum*[4]. All stable varieties have attained chlorophyll efficiency of degrees, the deficiencies being eliminated by a process of vigilant mass selection through a number of years. In dry crops where the stand is uncertain, the yield meagre and the seed rate important, no cultivator can afford to sow seed some of which would throw albino seedlings. At the Millets Breeding Station, Coimbatore, where a number of races are brought into an impact with each other, optimum conditions prevail, (especially in a protogynous crop like the pearl millet), for the coming together of factors which in isolation might not be lethal, but whose lethal propensities have been activated by inadvertent association. A number of experiences in the chlorophyll deficiency of this millet have therefore been met with[4]. The pursuit of albinism in this protogynous crop is beset with peculiar difficulty. No useful Mendelian deductions can be drawn except on selfed material; and selfing is particularly difficult in this crop with its protruding stigmas. Nevertheless a number of plants have been selfed and this phenomenon of albinism pursued in some aspects.

The simplest case is a single factor difference that marks out the surviving green from the albino that dies. The albino is pure white. Simple segregations from plants (selfed through two generations) taken from an original segregation of a natural cross, confirm the existence of this factor designated C, whose absence, results in a lethal albino. Of the 30 heads selfed and sown, 20 segregated again, and 10, as expected, proved pure for green.

Table I.

Family Numbers.	Number of Selections.	F_3 Seedlings Segregation Total	
		Green.	Albino.
P. T. 598	5	1,843	675
„ 599	5	2,723	924
„ 600	2	1,022	310
„ 601	3	1,427	477
„ 602	3	1,942	646
„ 603	2	1,144	358
	Grand Total	10,101	3,390
	Expected 3 : 1	*10,173*	*3,373*

* Tamil—*Kambu.*

Germinations of the small grains of this millet are best done in pots and not in the field. It has been found that splitting the spike in longitudinal halves and setting the split halves in wet sand will give an *in situ* germination, showing the segregation very graphically[5].

In the second instance the deficiency in chlorophyll has not proved lethal. Seedlings turn pale green, but live and produce weak plants. These pale plants are light green in all parts bearing chlorophyll, such as leaves, stem, glumes, and bristles. Similar pure materials, P. T. 596 (green) and P. T. 597 (pale green) extracted from an original segregate were secured by selfing. These were again artificially crossed. This pale green has proved a simple monofactorial recessive due to the absence of a factor designated E which conditions the efficient manifestation of C. The following table gives the segregates obtained from this family.

Table II.

P. T. 597 × P. T. 596 = Cross No. P. T. XIII

Family Numbers.	F_2 Seedling Segregation	
	Green.	Pale green.
P. T. XIII/1	589	193
„ XIII/2	473	150
„ XIII/3	457	145
„ XIII/4	238	75
Total	1,757	563
Expected 3 : 1	*1,740*	*580*

Three F_1 plants from the cross between green and pale green were back-crossed with the recessive pale green and the following table gives the segregates obtained.

Table III

Head Number	Seedling segregation	
	Green	Pale green
1.	520	488
2.	511	479
3.	341	373
Total	1,372	1,340
Expected 1 : 1	*1,356*	*1,356*

Pale green plants are poor in growth and produce weak heads. The following table gives the economic disabilities of these plants as compared with the normal green and the intermediate F_1 plants.

Table IV

Averages of fifty Readings.

Variety Number	Plant Character.	Height cm.	Number of tillers.	Weight of main head gm	Grain yield of main head gm.	Number of grains in 2 gm weight. (Density.)
P. T. 43	Green	200	4	15	12	345
P. T. 597	Pale Green	130	1—2	10	4	432
P. T. 43 x P. T. 597 F_1	Green	150	3	13	8	310

A conjoint experience giving greens, pale greens and albinos was also gained from Cross No. P. T. XVI (P. T. 597 x P. T. 43 a heterozygous green), an instance throwing light on the manner in which two apparently healthy plants might, on crossing, produce lethals. The triple segregates obtained from the F_2 families of this cross are given below.

Table V.

Family Number	F_2 Seedling segregation.		
	Green.	Pale green.	Albino.
P. T. XVI/10	122	46	64
„ XVI/13	238	73	95
„ XVI/16	158	50	62
„ XVI/21	268	99	112
„ XVI/24	224	85	102
„ XVI/29	294	106	142
„ XVI/37	183	62	82
Total. ...	1,487	521	659
Expected 9 : 3 : 4	*1,500*	*500*	*667*

In this connection it is interesting to record an isolated instance in our work on this millet in which the stigmas of one variety instead of being hyaline, developed a purple pigment. This purple pigment in the stigma could be perpetuated in some of the progeny by selfing, but such progeny gave evidences of primitive disabilities like albinism, striping in the leaf, hairiness on the leaf, sparseness of grain in the earhead and a general tendency to a wilder condition. This purple seemed therefore a sort of distress purple. Such indices to defective and lethal potentialities are not of a common occurrence, but as one of the ways in which such deficiencies may find expressions, this experience is interesting.

These recessive chlorophyll deficiencies are therefore best handled in a breeding station by their elimination through selfing and breeding, so much so that non-defective seed could be sent out for distribution. Another point to be borne in mind is the possible interaction between latent factors in the introduced and the local variety, so that without

an examination of such possibilities it will be hazardous to indiscriminately introduce and grow new varieties side by side with existing good ones. This risk is very real, especially as many more factors than two are known to exist in the production of efficient chlorophyll in cereals generally.

Summary. Chlorophyll deficiences resulting in pale and albino seedlings have been met with in the pearl millet (Pennisetum typhoides, Staff and Hubbard). A factor C produces chlorophyll. In its absence the seedlings are white and die. C is a simple dominant to c. A second factor E conditions the efficient manifestation of C. C with E produces good green seedlings. Without E, the plants are pale green and weak. E is a simple dominant to e, but can operate only when C is present.

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THE '*SOORAI*' DISEASE OF PADDY

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Introduction. The 'Soorai' disease of paddy is caused by a mealy bug—*Ripersia oryzae*, Green,—belonging to family Coccidae, order Rhynchota. The insects suck the plant sap and, as a result of their attack, the affected plants get stunted in growth. In severe cases of infestation the earheads get smothered and either fail to emerge from the sheath or when emerged do not produce healthy grains. The infestation is seen to occur in patches in the field.

Distribution of the Pest. Numerous reports of the occurrence of the pest are on record in the files of the Government Entomologist, the first one being in 1909, from Salem District. The pest has been reported from the following taluks in the Madras Presidency.—Berhampore, Anakapalle, Peddapuram, Nellore, Trichinopoly, Ariyalur, Mayavaram, Tanjore, Kumbakonam, Palni, Attur, Salem, Dharapuram, Palghat and Walluvanad.

In view of the fact that reports of the pest are being received from the various parts of the Presidency, an attempt is made to present the facts so far ascertained regarding the pest as a result of the studies made at the Agricultural Research Station, Aduthurai.