A chemical examination of a small quantity of the dried petals collected in October 1933 in Coimbatore showed that they contained only a small amount of yellow colouring matter. From this was isolated as the main portion a yellow non-glycosidic pigment melting at 270–75° (I), a small amount of a yellow glycoside melting at 228–30° with decomposition (II) and a very small quantity of a third substance (III) which could be obtained pure only as its acetyl derivative melting at 182–85°. Examination of a larger quantity of the petals obtained from Trichinopoly in the summer of 1936 contained the glycoside (II) only. Compounds (I) and (II) are closely related as shown below. (III) could not be studied since the amount was too small.

The glycoside (II) which is now given the name 'populnin' has the formula $C_{20}H_{18}O_{11}$. It undergoes hydrolysis readily to yield a molecule of glucose and a crystalline aglucone (I) called 'populnetin' having the formula ($C_{14}H_8O_6$). The aglucone forms a colourless tetra-acetyl derivative melting at 127–29°.

The following characteristics of populnin as well as of populnetin are noteworthy. They are unaffected by neutral lead acetate solutions whereas with basic lead acetate they form orange red precipitates. They give pale green colour with ferric chloride. With aqueous alkali the glucoside forms a deep yellow solution whereas the aglucone gives a red solution and both slowly fade to a pale brownish yellow. Their solutions in concentrated sulphuric acid possess a remarkable green fluorescence which disappears on the addition of water.

The constitution of populnetin is under investigation. It does not seem to be a flavone or flavonol. All its reactions indicate that it belongs to the group of hydroxy anthraquinone pigments. It is, therefore, suggested that it is a tetrahydroxyanthraquinone.

K. Neelakantam.
T. R. Seshadri.

Department of Chemistry,
Andhra University,
Waltair,
May 5, 1938.

[1] *Watt's Dictionary of Economic Products of India.*

[2] A. G. Perkin, *J.C.S.*, 1909, 1859.

The Coupling Phase of the Linkage Relationship between "Leaf-Sheath-Glume" and "Dry Anther-Grain" Colours in Sorghum.

In a previous paper[1] the repulsion phase of a linkage between the factor for leaf-sheath and glume colour (Qq) and the factor for brown colour in dry anther and grain (Bb) has been recorded. The two parents figuring in that experience had the following characters. Parent (1) Reddish purple leaf-sheath and glume and no brown colour in the dry anther and no brown wash on the grain. Parent (2) Blackish purple leaf-sheath and glume and brown colour in the dry anther and brown wash on the grain. The first generation plant had reddish purple sheath and glume and brown colour in the dry anther and brown wash on the grain. In the F_2, instead of the dihybrid 9 : 3 : 3 : 1 ratio, there always occurred a 2 : 1 : 1 : 0 ratio of the double dominant and parental groups, the double recessive group being absent. The double dominants always segregated and the linkage was absolute.

In all the wild sorghums so far examined, the leaf-sheath and glume are blackish purple and the grain is brown in colour. An examination of the large collection of sorghums gathered from all over the world at the Millets Breeding Station, Coimbatore, leads to the general conclusion that broadly speaking the black-glumed groups of sorghum are mostly African in origin and the red-glumed ones predominantly Indian and Asiatic. The characteristics of the existing types of sorghum in India amply prove that there was an introduction of the African races into India and that in consequence there was free hybridisation and subsequent selection of valuable individuals. It is a matter of common knowledge that given the choice, the cattle relish fodder of sorghum plants with a reddish purple leaf-sheath in preference to those with a blackish purple leaf-sheath. The blackish purple leaf-sheath brings in its train the brown wash on the grain and this wash is an advantage to grains liable to be caught up in rains at the maturing stages. It is a matter of common experience that grains with a brown wash do not turn mouldy and discoloured so quickly as grains without the wash. The wash is therefore an asset in

any pressure necessitating the extension of the area under sorghum from favourable to partially unfavourable climatic environments. This impact between the African and Indian races of sorghum coupled with many new-place effects, must have resulted in the production of many mutants having the characteristics of both the Asiatic and African sorghums, with the result that in the course of time such mutations were spotted out and the desirable ones perpetuated as varieties of economic value. The large number of current South Indian varieties with a reddish purple leaf-sheath and a brown wash on their grain is proof to the selective influences that must have operated consequent on this impact.

As a corollary to this perpetuation of mutants having these favourable double dominant characters, the incidence and chances of perpetuation of the double recessives with their dual disabilities have also to be looked out for. In the stream of seed material passing through a breeding station, there are chances of meeting with mutants having a blackish purple leaf-sheath and no brown wash on the grain. Such a mutant was available in A.S. 1641—a chance occurrence in a cross between parents that had no wash on the grain and no black in their purple sheaths.

The availability of this mutant (A.S. 1641) helped to establish the linkage referred to above in the coupling phase. In crosses Nos. A.S. CXXXIII and CXXXIX, the double dominants and the double recessive were brought together. The details about the crosses, F_1 and subsequent generations are given in Table I.

From Table I, it will be seen that the segregation is of the simple monohybrid type, there being no off-types indicating a break in the linkage. From the data of both coupling (population 1863) and repulsion (population 9855) phases, it will be obvious that the linkage is absolute.

The many off-type varieties under cultivation in the double dominant group and the few in the double recessive group met with in a breeding station are evidently mutational in origin, the mutations being favoured by the new place effect and perpetuated according to their utility and survival value.

Crosses were effected between A.S. 1641, the double recessive and each of the three types—the one dominant, the other dominant, and the heterozygous double dominant, and also between the heterozygous double dominant and the single dominants. The results of these crosses presented in Table II conform to expectations.

TABLE I.

	Leaf-sheath and glume	Reddish Purple	Blackish Purple
	Dry anther	Brown	No Brown
	Grain	With Brown Wash	No Brown Wash
	Parents		
	A.S. 349 ♂		
	A.S. 1641 ♀ Cross CXXXIII		
F_1	.. ..	F_1	
	A.S. 318 ♂		
	A.S. 1641 ♀ Cross CXXXIX		
F_1	.. ..	F_1	
F_2	From Cross CXXXIII A.S. 3701 and 3702	419	128
	,, ,, CXXXIX A.S. 3703 and 3704		
F_3	(From A.S. 3701)		
	Homozygous dominants (five families)		
	A.S. 4432, 4437, 4440, 4443 and 4445	462	
	Heterozygous dominants (fifteen families)		
	A.S. 4426 to 4431, 4433 to 4436, 4438, 4439, 4441, 4442 and 4444	991	325
	Total of segregates ..	1410	453
	Expectation 3 : 1 ratio ..	1397·25	465·75
	$\chi^2 = \cdot 465$ P $> \cdot 3$		

TABLE II.

Cross No.	Parents		F_1 Population	Expectation %
A.S. CCIII	A.S. CXLIX	A.S. 2528	QqBb — 12	50
	(QqBb)	(qqBB)	qqBB — 10	50
„ CCIV	Do.	A.S. 817	QqBb — 13	50
		(QQbb)	QQbb — 12	50
„ CCVII	A.S. 1641	A.S. CXLIX	Qqbb — 5	50
	(qqbb)	(QqBb)	qqBb — 5	50
„ CCV	Do.	A.S. 817		
		(QQbb)	Qqbb — 33	All
„ CCVI	Do.	A.S. 2528		
		(qqBB)	qqBb — 1	All

To sum up ; Most of the African races of sorghum have a blackish-purple leaf-sheath and glume, brown colour in the dry anther and a brown wash on their grain (qqBB). The Asiatic races are predominantly characterised by having a reddish purple leaf-sheath and glume, no brown colour in the dry anther and no brown wash on their grains (QQbb). There is a complete linkage between Qq (factors for leaf-sheath and glume colour) and Bb (factors for brown colour in dry anther and grain). This has been established in both the repulsion and coupling phases by suitable crosses.

G. N. RANGASWAMI AYYANGAR.
A. KUNHIKORAN NAMBIAR.
Millets Breeding Station,
Coimbatore,
June 16, 1938.

[1] *Ind. J. Agric. Sci.*, 1934, **4**, 90.

A New Phanerogamic Parasite of *Andropogon Sorghum (Jowar).*

Andropogon Sorghum (*Jowar*) is extensively cultivated in Central and Peninsular India and parts of North India for its grain and stalk. It is a staple food crop in some parts of India and an important source of fodder to cattle wherever cultivated. Sorghum, besides being subjected to severe attack by fungi and insect pests, is also often considerably damaged due to attack by phanerogamic parasites. The only parasitic flowering plant so far recorded as attacking Sorghum belongs to the genus *Striga*. Three species of this genus all of which are root parasites are found to attack Sorghum in India. To this will now be added another of a different genus mentioned below.

Two years back the writer while collecting seeds of *Striga* species on Sorghum from different places came across a large patch of unirrigated Sorghum in a cultivator's field thickly infested with *Sopubia delphinifolia*. This field was near a village called Sutharwadi about 19 miles from Poona. It was at first thought that *S. delphinifolia* was present on the grass which had invaded the Sorghum plot. The following year *S. delphinifolia* was again observed in a Sorghum plot near a village called Aundh about five miles from Poona in a different direction to Sutharwadi. Careful examination of the root-system showed that *S. delphinifolia* was definitely attacking Sorghum by its roots establishing connection with the roots of Sorghum (Figs. 1 and 2). It was found that a single parasitic plant had its roots connected with the roots of three or four host plants. In Fig. 1 the parasite is shown attacking two Sorghum plants. At both places where *S. delphinifolia* was found on Sorghum the attack was severe and in consequence the host plants were very much dwarfed in growth.

Fyson[1] alone refers to *S. delphinifolia* as a root parasite on grass occurring usually in the open. Hooker[2] and Cooke[3] merely give the number of species belonging to the genus *Sopubia* and their distribution. Whether *S. delphinifolia* attacked plants other than uncultivated grasses was