

## Stigma Receptivity in Cytoplasmic Male - Sterile Sorghum Type Under Indian Conditions.

by

K. MAHUESWARAN,  
Millet Assistant Agricultural College and Research  
Institute. Coimbatore.

**Introduction :** In a programme of breeding hybrid sorghums, utilisation of cytoplasmic-induced male-sterile lines has great advantages. In this, however, it became necessary to study how far the stigmas are similar to the normal fertile ones in their behaviour under different environmental conditions.

Floral biology has been studied in this crop by Ball (1910), Graham (1916), Ramanathan (1924), Vinall (1926), Patels (1929), Rangaswami Ayyangar and V. Panduranga Rao (1931) etc. In general, it is given that the stigmas come out first sometimes as early as 15 to 36 hours before the appearance of the stamens. Ball and Vinall record that the flowers open in the early morning hours. According to Patels it is in the forenoon from 4 A. M. Graham says it is from 11 P. M. to 4 P. M. the next afternoon. Ramanathan's findings show that the flowering period is between 1 A. M. to 4 P. M. According to observations made at Coimbatore, it varies from variety to variety. *S. durra*, *S. roxburghii*, *S. nervosum* commence opening their flowers at midnight and the opening continues till 8 A. M. and may get prolonged to 10 A. M. at the most. *S. margaretiferrum*, a sorghum from Sierra Leone Flowers from 8. A. M. to 4 P. M. and it is recorded that a panicle takes 9 days to complete the anthesis.

Cytoplasmic male-sterile one was first isolated in America from a cross between Day Milo and Kafir. Ross (1957) studied in detail the receptivity of the stigma in two lines of cytoplasmic male-sterile ones in the year 1957. He used panicles which were bagged at the time of the exertion of the head and about 2 to 3 days before flower opens. Such heads were left for seven days and then pollinated at 2 day intervals till the 29th day after bagging. To facilitate observations, heads were bagged on different days and for each set of pollinations, five panicles were taken at a time. He concluded that stigmas in some flowers at the base of the panicle may remain receptive 15 to 17 days after bagging. The majority were non-receptive.

Several male-sterile lines were added to the collections of sorghums at the Millet Breeding Station, Coimbatore with a view to utilise for hybridisation. Studies were conducted to examine the stigma receptivity under the local conditions.

**Materials and Methods :** The material consisted of a single male-sterile line obtained from Dr. Parker, Chandrigarh, Punjab. The observations on the stigma receptivity were conducted during the summer seasons 1957 and 1958. The plants were grown under irrigation. The plot size was 25 links long and 2 links broad with 4 links wide between plot to plot. A set of five plants in each plot was selected for observations, constituting ten groups each year

In the sorghum panicle the anthesis generally proceeds from the apex of the panicle towards the base. Each day a set of flowers matures and blooms. This blooming period extends to 9 days from the opening of the first flower to that of the last flower. In a study on the longevity of the stigma-receptivity the number of flowers opening on a different day contributes to vitiate observations. To overcome this difficulty, each panicle from all the selected plants were treated in such a manner that about 100—200 florets all opening on the same day were left untouched and the others were clipped off. The prepared panicles were bagged on the same day and an interval of one day was given to confirm the emergence of the stigmas of all the flowers. Each set of five such prepared plants was pollinated each day with pollen collected from several varieties. The last dusting was on the 11th day after bagging. The bags were removed after 20 days from the date of last pollinations. The seed set in each panicle was counted and the average for each set of five panicles was worked out. The summarised data is given below :

<i>Data</i>	<i>American Condition</i>	<i>Indian Condition</i>	
		Actual seedset %	
Particulars	Estimated seedset %	Summer 1957	Summer 1958
Days after bagging			
1st day			
2nd day		41	44
3rd day		30	47.6
4th day		66	53.4

Particulars	Estimated seedset %	Actual seedset %	
		Summer 1957	Summer 1958
Days after bagging			
5th day		73	34.5
6th day		38	39.8
7th day	81	11	34.5
8th day		Missing	29.7
9th day	86	6.2	8.5
10th day			3.8
11th day	83		2.5
13th day	72		
15th day	29		
17th day	13		
19th day	⊙		
21st day	⊙		
23-29th day	⊙		
Latitude	38° 52' N.		11° N.
Longitude	99° 19' W.		77° E.
Maximum mean temperature	88-98° F.		83-96° F.
Minimum mean temperature	45-59.3° F.		64.2-74.2° F.
Altitude	2000 a. s. l.		1414 a. s. l.
Soil	Silt loam		Red loam
Rainfall (annual)	21.10"		23.23"

⊙ = A few seeds.

**Discussion:** The data shows that the sorghum stigmas can remain receptive for a period of 11 days after exertion. However the receptivity is highest till the 5th day. Thereafter it becomes markedly low till the eighth day. Ross tested the panicles for receptivity till 29 days after bagging. Though a few seeds were set they were rather poor. In his observations the maximum seedset is within 5 days. He seems to have assumed that in a given period of 7 days after bagging all the flowers would have completed blooming. In sorghum the observations of previous workers showed that under

bagged conditions blooming can take place for 9 days. This probably explains the occurrence of seedsetting beyond the 17th day upto 29th day. The observation made in their stations show that stigmas can remain receptive for 10 days.

It is concluded that under Indian conditions also the stigmatic receptivity is similar to the American conditions.

**Summary:** A cytoplasmic male-sterile line A. 385 was received and longevity of stigma receptivity studies were conducted under Indian conditions similar to American conditions. The maximum seedset was on the fifth day and there was seedsetting even on the eleventh day. Thus it has been concluded that the stigmas are receptive for a period of 10 days both under Indian and American conditions.

#### REFERENCES

1. Ball (1910) *Amer. Breed. Mag.* 1, 284.
  2. Graham (1916) *Mem. Dept. Agric. Ind. (Bot. Series)* 8, 201—216.
  3. Ramanathan (1924) *Jour. Madras Agric. Student Union* 12, 1—17.
  4. Vinall (1926) *Jour. Hered.* 17, 296—298.
  5. Patel and Patel (1929) *Mem. Dept. Agric. Ind. (Bot. Series)* 16, 1—58.
  6. G. N. Rangaswami Ayyangar & V. Panduranga Rao (1931) *Ind. Jour. Agri. Sci.* Vol. 1. Part IV, August 1931.
  7. Ross, W. M. (1957) *Agron. Jour.* Vol. 49—No. 4—April.
-