REFERENCES

GRIFFING, B. 1956a. A generalised treatment of use of diallel cross in quantitative inheritance. Heredity, Lond. 10: 31-50.

GRIFFING, B. 1956b. Concept of general and specific combining ability in relation to diallel crossing system. Aust. J. Biol. Sci. 9: 463-93.

GOPINATH, D.M., RAMANA RAO, V.V., SUBRAMANYAM, M. and NARAYANA, C.L. 1966. A study of diallel crosses between varieties of Nicotiana tabacum L. for yield components. Euphytica., 15: 171-8.

GOPINATH, D.M., LAKSHMINARAYANA, R. and NARAYANA, C.L. 1967. The mode of gene action in flue cured tobacco. Euphytica., 16: 293-99.

NASKAR, S.K. and RAO, R.V.S. 1984. Combining ability analysis in cigar-filler tobacco. Indian J. agric. Sci., 54(8): 651-4.

RAI, M. and DAS, K. 1974. Combining ability components of yield in Linseed. Indian J. Genet., 34(3): 371-5.

SPRAGUE, G.F. 1966. Quantitative genetics in plant improvement. pp.315-54. Frey, K.J. (Ed) Iowa State University Press, Ames, Iowa.

SASTRY, A.B. and RAO, PRASADA,P.V. 1980. Genetic analysis of certain quantitative characters in intervarietal crosses of Nicotiana tabacum L. Tob. Res., 6(1): 32-38.

SASTRY, A.B., RAO,R.V.S., SUBRAMANYAM,M. and PRASADA RAO, P.V. 1984. Heterosis and combining ability studies in intervarietal crosses of flue cured tobacco (Nicotiana tabacum L.). Tob. News. 7(2): 7-12.

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STUDIES ON IMPAIRED SEED-SET IN THE MOTHER PLANT (ms 2219A) DURING SORGHUM COH2 HYBRID SEED PRODUCTION

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ABSTRACT

Studies on the impaired seed-set during CoH2 hybrid seed production in Coimbatore district during December-January season of 1983-84 revealed that 61 per cent of female (ms 2219A) plants exhibited the symptom of impaired seed-set. Cent per cent of the affected plants were producing side shoot from any of the leaf axils. The problem of impaired seed-set relative to observations recorded is discussed.

KEY WORDS: Sorghum hybrid, Seed production, Seed-set.

In Tamil Nadu, hybrid sorghum seed production is undertaken in an area of 600 ha of which CoH2 hybrid occupies 25 per cent of the area. Problem of impaired seed-set was encountered in the seed production plots sown during December-January season of 1983-84 in Coimbatore district. Krishnasamy (1982) found that non-synchronised flowering between the parental lines might result in poor seed-set. Hence, detailed observations were recorded in a field under CoH2 hybrid seed production, situated near the Agricultural College and Research Institute, Coimbatore.

MATERIALS AND METHODS

In the CoH2 (ms 2219A x IS 3541) seed production plot sown during January 1984, seven locations of 4 m^2 each were randomly marked and plant counts were made on (i) plants with impaired seed-set, (ii) affected and unaffected plants with side shoots and (iii) affected and unaffected plants with stem borer attack. Twenty-five plants manifesting impaired seed-set in the top, middle and bottom portions of the earheads and with full seed-set were randomly selected and observations on plant height, stem diameter, earhead length and length of the portion of the earhead with impaired seed-set, leaf axil at which side shoot occurred, and the internode in which entry hole of stem borer occurred were recorded. For conducting the chi-square test, leaf axils from which side shoots developed were grouped into lower (bottom three), middle (4th and 5th from bottom) and top (6th, 7th and 8th from bottom) and similarly the internodes in which the entry holes of stem borer (Chilo partellus Swinhoe) noticed were designated as lower, middle and top.

RESULTS AND DISCUSSION

Among the mother plants (ms 2219A), 61 per cent exhibited the symptom of impaired seed-set either at the top, middle or bottom portions of the earhead. The unaffected portion possessed normal seed-set. Non-synchronisation of flowering between the parental linees is a cause for poor seed-set in hybrid sorghum seed production (Krishnasamy, 1982). However in the seed plot where the present study was conducted, adequate staggering of sowing of the parental lines had been followed and the synchronisation of flowering was perfect.

When the plants were

Table 1. Percentage of plants showing impaired seed-set and related symptoms in seven locations of seed field of sorghum cv. CoH2.

Location	Plants with impaired see-set	Affected plants with side shoot	Affected plants with stem-borer attack	Unaffected plant with side shoot	Unaffected plants with stem borer attack
I	60	100	95	Nil	5
II	55	100	97	Nil	3
III	50	100	96	Nil	2
IV	65	100	95	Nil	3
V	70	100	98	Nil	5
VI	75	100	99	Nil	4
VII	55	100	96	Nil	3
Mean	61	100	97	Nil	3.6

closely observed, it was found that all the affected ones were having side shoots and 97 per cent of the affected plants showed stem-borer feeding. It was found that the unaffected plants possessed no side shoots; whereas 3.6 per cent of the unaffected plants were having the mine hole of the stem-borer. Stem-borer feeding is known to cause the development of side shoots which may result in reduced seed yield in the affected plants (Mahadevan, 1984). However, it was intriguing that some of the plants with no stem-borer feeding had the side shoots developed. It was increasingly evident that there existed a close correlation between the side shoot occurrence and impaired seed-set. It could be plausible that during the initiation of inflorescence primordium, certain temporary metabolic stresses could have occurred thereby partially negating the apical dominance, which could have triggered the development of the side shoot. Such a brief spell of metabolic stress occurring during floral initiation might have affected the development of gynoecium and

Table 2. Plant growth parameters as related to the impaired set in different portions of earheads

Growth parameter	Portion of impaired seed-set			Plants with full seed-set	CD (P=0.05)
	Top	Middle	Bottom		
Plant height (cm)	93	101	101	101	NS
Stem diameter (cm)	1.49	1.09	0.99	1.24	0.15
Earhead length (cm)	25.7	24.0	23.6	25.4	1.75
Length of the portion of earhead with impaired seed-set (cm)	10.6	6.1	10.4	-	2.01

thus resulted in the abortion of the spikelets differentiating at the period in the male-sterile line.

In order to find out the factor (s) relative to the impaired seed-set in any particular portion of the earhead, observations on the leaf axil at which side shoot had occurred, internode in which the stem-borer entry hole was noticed, plant height, stem diameter, earhead length and length of the portion of earhead with impaired seed-set were recorded. Interestingly, the leaf axil at which the side shoot had occurred and the internode in which the stem-borer entry hole was noticed and plant height did not reveal any significant relationship with the impaired

Table 3. Frequency score of plants with side shoots and stem borer entry holes occurring in the lower, middle and upper leaf axils and internodes respectively

Portions of earhead with impaired seed-set	Leaf axils			Total
	Lower	Middle	Upper	
Side shoot				
Top	3	11	10	24
Middle	5	12	7	24
Bottom	11	19	9	39
Total shoots	19	42	26	37
Entry holes	**Internodes**			
Top	3	4	9	16
Middle	0	6	10	16
Bottom	2	5	6	13
Total entry holes	5	15	25	45

Chi square test - Not significant

seed-set in any portion of the earhead. Frequency of plants having side shoot growth from middle leaf axils (4th and 5th from bottom) and frequency of those having stem-borer entry holes in the top internodes (6th, 7th and peduncle) were relatively more, irrespective of the portion of the earhead with impaired seed-set. However, plants exhibiting impaired seed-set at the top portion of the earhead were characterized by thick culm and long earhead; the portion of earhead with impaired seed-set was also more than in others in which the impaired seed-set was observed at the middle and bottom portions.

Weather factors are known to cause changes in the fertility of sorghum earheads (Niu and Du, 1981). This year the weather during the crop period of the present study had deviated a little from the normal. Rainfall was more and concomitantly maximum and minimum temperatures were relatively low and high respectively, besides the humidity being high. The hours of sun shine were also considerably less from planting to inflorescence primordium initiation. According to Niu and Du (1981), floret abortion increased with decreasing light intensity as well. Further, they found that male-sterile line was more sensitive. Incidence of rains during the period of anthesis would wash off the pollen and prevent pollination but this could not lend credence to the present situation because of the fact that the examination under stereozoom microscope of the dissected spikelets, that did not set seed, had revealed that the ovary, style and stigma as well as the lodicules were shrunken and defunct. The florets had not at all opened. It could therefore, be concluded that the impaired seed set observed in CoH2 hybrid seed production in the present instance, could be the manifestation of side shoot development caused by metabolic stress countering the apical dominance, freak weather conditions favouring spikelet abortion and stem-borer infection resulting in the disfunction of the well differentiated spikelets, owing to lack of anthesis brought about by the impeded water and nutrient supply on account of stem-borer disrupting the vascular tracts.

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REFERENCES

KRISHNASAMY, V. 1982. Studies on certain aspects of production and storage of sorghum seed. Ph.D. thesis, Tamil Nadu Agricultural University, Coimbatore.

MAHADEVAN, N.R. 1984. Bio-ecology and damage potential of the sorghum stem borer, *Chilo partellus* (Swinhoe). Ph.D. Thesis, Tamil Nadu Agricultural University, Coimbatore.

NIU, T.T. and DU, Y.T. 1981. (Studies on the cause of floret abortion in male sterile lines of sorghum). **Shanxi Nongye Kexue** (Shanxi Agricultural Sciences) (1981) No.9, 2-4.