

**CHANGES IN PHENOLIC CONTENTS OF
SORGHUM AND MAIZE CULTIVARS
RESISTANT AND SUSCEPTIBLE TO
SORGHUM DOWNY MILDEW**

DOWNY mildew caused by *Peronosclerospora sorghi* (Weston and Uppal) Shaw does considerable damage to sorghum and maize crops. The source of primary infection is soil-borne oospores which germinate and invade host seedlings. Some varieties of sorghum and maize show a natural resistance to downy mildew. Many workers¹⁻⁵ have correlated the presence of high amount of phenols with resistance to various pathogens and non-pathogens. The purpose of this study is to estimate the total phenolic content at different growth stages in leaf and root tissues of resistant and susceptible sorghum and maize plants and to look for a possible correlation with disease resistance.

Sorghum [susceptible: DMS 652 and Swarna; resistant: CSV-5 (148) and I.S. 184] and maize (susceptible: CM 500 and Eto 25; resistant: Phil, DMR-1 and DMR-5) leaves and roots from one, two and three-week old diseased and healthy plants were selected. One gram leaf and root samples of each diseased and healthy cultivars were collected separately, cut into pieces and put into boiling 80% ethyl alcohol. After 5 min it was cooled, ground in a pestle and mortar, filtered through cheese cloth and the residue was re-extracted with alcohol. The combined filtrate was made to 5 ml and the total phenols estimated⁶. The results are expressed in "tannic acid equivalents".

The results in Tables I and II indicate that the total phenols were higher in the leaves than in the roots irrespective of the variety or infection. The leaves

TABLE I

Total phenols in leaves of susceptible and resistant sorghum and maize cultivars to downy mildew (*P. sorghi*)

Cultivar		Age of plants in weeks		
		1	2	3
mg/g (fresh weight)				
Sorghum				
Susceptible				
DMS 652	Healthy	1.32	2.56	3.78
	Diseased	1.53	2.73	4.93
	Adjacent to diseased area	1.72	3.93	5.12
Swarna	Healthy	1.25	2.65	3.89
	Diseased	1.62	2.83	4.97
	Adjacent to diseased area	1.80	3.98	5.21
Resistant	Healthy			
	CSV-5 (148)	1.31	2.82	3.92
	I.S. 184	1.29	2.63	3.94
Maize				
Susceptible				
CM 500	Healthy	2.52	3.25	5.92
	Diseased	3.98	4.72	7.26
	Adjacent to diseased area	4.67	6.12	8.99
Eto 25	Healthy	2.54	3.32	5.98
	Diseased	3.23	4.89	7.99
	Adjacent to diseased area	4.73	6.32	8.13
Resistant	Healthy			
	Phil. DMR-1	2.51	3.87	5.82
	Phil. DMR-5	2.47	3.60	5.91

and roots of susceptible sorghum and maize cultivars infected with *P. sorghi* contain more of total phenols than their healthy counterparts. The total amount of phenols in sorghum and maize cultivars was more in the healthy regions adjacent to the areas colonised by the fungus. The concentration increased in 2-week old plants and it was still more in the 3-week old plants. Maize cultivars contained a higher amount of phenolic compounds compared to sorghum. There is no appreciable difference in phenolic contents of resistant and susceptible cultivars of uninfected sorghum and

maize. The resistant reaction may be due to the fact that following infection, phenols accumulate faster in resistant varieties than the susceptible ones to check the fungal growth. Accumulation of higher amount of phenols in the diseased area and also in the tissues adjacent to infection is suggestive of active metabolic changes taking place in the diseased plant. Cruickshank and Perrin⁷ have shown that the metabolic changes occurring in diseased plants, frequently lead to accumulation of aromatics, especially phenolic compounds. Rubin and Artsikhovskaya⁸ commenting

TABLE II

Total phenols in roots of sorghum and maize cultivars susceptible and resistant to downy mildew (*P. sorghi*)

Cultivar		Age of plants in weeks		
		1	2	3
mg/g (fresh weight)				
Sorghum				
Susceptible				
DMS-652	Healthy	0.67	1.85	2.10
	Diseased	1.25	2.32	2.70
Swarna	Healthy	0.62	1.92	2.42
	Diseased	1.65	2.92	3.15
Resistants	Healthy			
	CVS-5 (148)	0.63	2.00	2.18
	I.S. 184	0.61	1.92	2.25
Maize				
Susceptible				
CM 500	Healthy	1.96	3.10	3.62
	Diseased	2.96	4.15	4.53
Eto 25	Healthy	1.96	3.10	3.62
	Diseased	2.61	3.83	4.11
Resistant	Healthy			
	Phil. DMR-1	1.92	2.92	3.52
	Phil. DMR-5	1.93	3.22	3.54

on the role of phenol in resistance suggest that phenols are oxidized to highly reactive quinones which are effective inhibitors of enzymes having sulphhydryl groups, thereby preventing metabolic activities of host and the fungal cells.

The increase in the total phenolic compounds in the mature plants can be correlated with the increase in resistance to the infection by the downy mildew (*P. sorghi*). Sorghum and maize plants are usually very susceptible to downy mildew upto three weeks and become resistant after this period. The susceptible plants become resistant as the phenolic compounds increase.

The authors wish to record their thanks to Prof. K. M. Saseeulla, Downy Mildew Research Laboratory, Mysore, for valuable suggestions and critical perusal of the paper, and to the University of Mysore for the facilities.

Downy Mildew Research
Laboratory,
University of Mysore,
Manasagangotri,
Mysore 570 006,
October 13, 1979.

H. SHEKAR SHETTY,
RASHEED AHMAD,

1. Walker, J. C., *J. agric. Res.*, 1923, **24**, 1919.
2. Kuc, J., *Agr. Exp. Sta. Bull.*, 1963, **663**, 20.
3. Clans, E., *Naturwissenschaften*, 1961, **61**, 106.
4. Rohringer, R. and Samborski, D. J., *Ann. Rev. Phytopath.*, 1967, **5**, 77.
5. Kosuge, T., *Ibid.*, 1969, **7**, 195.
6. A.O.A.C., Horowitz, W. (ed.), 1965, p. 219.
7. Cruickshank, I. A. M. and Perrin, D. R., Academic Press, New York, 1964, p. 514.
8. Rubin, B. A. and Artsikhovskaya, E. V., Pergamon Press, Oxford, 1963, p. 358.