SHORT COMMUNICATION

Rapid Biochemical Method for Screening the Fenugreek Germplasm Against Powdery Mildew Disease

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Fenugreek (*Trigonella foenum-graecum* L.) is an important multi-purpose cash crop of India grown during winter season. It is prone to many diseases and amongst them, powdery mildew caused by *Erysiphe polygoni* DC is the most devastating and serious which alone causes more than 50 per cent yield losses. Breeding resistant varieties to this disease is of *priori* consideration, for which screening of germplasm is a pre-requisite for the identification of resistant sources. Certain biochemical compounds like phenols and oxidative enzymes have been reported to impart resistance to many diseases in various crops but this information is lacking in fenugreek. Screening of germplasm at early stages on the basis of phenolic contents may be a good criterion in fenugreek also. Keeping this in view, total phenols and ortho-dihydric phenols in healthy and diseased leaves of resistant and susceptible genotypes to powdery mildew were estimated at different growth stages for the establishment of biochemical basis of screening the fenugreek germplasm.

The fourth leaf from the top were collected from the plants of two resistant (NLM and HM 350) and two susceptible genotypes (T 8 and HM 65) which were grown under two environmental conditions *i.e.* artificially

Table 1. Total phenols (mg g^{-1}) in healthy and diseased leaves of fenugreek genotypes at different stages of growth

Genotypes	40 DAS		80 DAS		100 DAS	
	E_1	E_2	E_1	E_2	E_1	E_2
NLM(R)	36.61±0.38	36.30±1.27	44.80±0.48	45.03±0.30	42.14±0.23	38.93±0.41
HM 350 (R)	36.77±0.17	37.65±0.87	44.23±0.19	44.49±032	41.62±0.99	39.24±0.26
T8(H)	29.73±0.50	29.27±0.48	31.85±0.31	31.74±0.82	31.67±0.73	29.62±0.47
T8(50% D)	–	–	35.78±0.64	36.75±1.36	32.31±0.13	31.08±0.54
T8 (100%D)	–	–	39.18±0.68	39.03±0.28	36.85±0.18	33.40±0.54
HM 65 (H)	30.98±0.63	31.33±0.69	32.11±0.33	32.25±0.29	31.18±0.51	30.80±0.19
HM 65 (50% D)	–	–	35.44±0.41	35.13±0.63	34.98±0.18	32.01±0.08
HM 65 (100% D)	–	–	37.78±0.18	38.17±0.53	36.76±0.46	34.50±0.09
C.D. 5%	–	–	2.13	1.98	1.77	2.09

DAS = Days after sowing; E_1 = Inoculated environment; E_2= Natural Environment; R= Resistant; H= Healthy; D= Diseased

Table 2. Ortho-dihydric phenols (mg g^{-1}) in healthy and diseased leaves of fenugreek genotypes at different stages of growth

Genotypes	40 DAS		80 DAS		100 DAS	
	E_1	E_2	E_1	E_2	E_1	E_2
NLM (R)	6.37±0.04	6.54±0.06	7.61±0.04	7.54±0.02	6.46±0.09	6.22±0.06
HM 350 (R)	6.42±0.03	6.37±0.04	8.53±0.12	8.37±0.03	7.12±0.05	6.34±0.07
T8 (H)	4.28±0.04	4.41±0.07	4.38±0.02	4.44±0.06	4.30±0-.04	3.82±0.05
T8 (50% D)	–	–	5.69±0.06	5.88±0.07	5.14±0.06	5.08±0.10
T8 (100% D)	–	–	6.30±0.06	6.26±0.13	5.90±0.06	5.49±0.49
HM 65 (50% D)	4.91±0.07	4.87±0.87	4.89±0.02	4.97±0.06	4.14±0.07	3.63±0.03
HM 65 (50% D)	–	–	5.61±0.10	5.53±0.02	5.25±0.16	4.77±0.09
Hm 65 (100%D)	–	–	5.88±0.04	5.94±0.04	5.75±0.14	4.93±0.09

inoculated (E_1) and natural (E_2). The leaf samples were collected at three growth stages *i.e.* before appearance of disease at 40 days after sowing (DAS), after infection, 80 DAS and at severity, 100 DAS. These samples were categorised as healthy (having no visible symptoms of powdery mildew) and disease (having 50% and 100% leaf area mildewed). The samples were first sun-dried, then oven dried at 60°C and ground to fine powder. Total phenols were extracted and estimated by the method of Swain and Hillis (1959), while ortho-dihydric phenols were determined as per Johnson and Schaal (1952).

The pattern of total phenols and ortho-dihydric phenols (Table 1 and 2) clearly indicates that resistant genotypes exhibited significantly higher contents of both these compounds in comparison to healthy and infected leaves of susceptible genotypes at all the growth stages under both the environments (E_1 and E_2). These findings are in close agreement to those obtained by Parashar and Sindhan (1986), Kalia and Sharma (1988) and Rathi *et al.* (1998) for powdery mildew disease in peas. In the defense response to pathogen, the contents of both the compounds increased from 40 to 80 DAS and then uniformly decreased at last stage (100 DAS) in all the genotypes in both E1 and E2. Moreover, all the genotypes exhibited higher contents of both the phendies in E1 and E2. Moreover, all the genotypes exhibited higher contents of both the phendies in E1 than in E2 at 100 DAS, whereas such trend was not observed at 40 and 80 DAS. Sempio *et al.* (1975) reported that resistance in plants is expressed by oxidation of phenols to quinones which are more toxic to pathogen. In susceptible genotypes the fungus got enough time for its growth, whereas in resistant cultivars higher accumulation of phenols at initial stages might have succeeded in restriction of the pathogen. Moreover, higher contents of phenolics in resistant genotypes might have resulted in *estrification* of cell walls restricting, thus the entry of the pathogen as suggested by Fry (1987). Therefore, it can be concluded that higher contents of both total and ortho-dihydric phenols in resistant genotypes at initial stages might have imparted resistant to powdery mildew disease in fenugreek. By using estimation of any one of these phenolics, germplasm in fenugreek can be screened against powdery mildew even before the appearance of the diseases. Moreover, this technique is quicker, simpler, reliable and also there is no need to create artificial inoculated conditions for screening the germplasm.

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