

RELATIONSHIP OF PHENOLS AND SUGARS IN ALTERNARIA BLIGHT RESISTANCE OF RAPESEED MUSTARD

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Midas (*Brassica napus*), RC 781 (*B. juncea*) and YRT 3 (*B. juncea*) resistant to *Alternaria* blight of rapeseed mustard had slightly higher level of phenols than the susceptible cultivars like Benoy (*B. campestris* var *yellow sarson*), Composite 2 (*B. campestris* var *toria*) and Varuna (*B. juncea*). After infection the phenol content increased in both the reaction but the accumulation was more in the resistant lines. Further the quantity of total sugars reduced rapidly in susceptible lines than the resistant lines. Accumulation of phenols and depletion of sugars were more in lesion areas of infected leaves than lesion-free areas of the same.

INTRODUCTION

Relation between the phenolic compounds and sugars with the resistance and susceptibility has been investigated in many plant diseases (Farakas and Kiraly, 1962; Patil *et al.*, 1985; Sharma *et al* 1983; Sujathamma and Reddy, 1986; Nema, 1983; Vidyasekarn, 1974). No information is available on the changes of phenols and sugars of rapeseed mustard infected with *Alternaria brassicae*. Hence an attempt has been made to investigate the changes in the quantity of phenols and total sugars of resistant and susceptible cultivars after infection with *Alternaria* blight pathogen.

MATERIALS AND METHODS

Three resistant cultivars of rapeseed mustard viz; Midas (*Brassica napus*), RC 781 (*B. juncea*), YRT 3 (*B. juncea*) and three susceptible cultivars viz; Benoy (*B. campestris* var *yellow sarson*), Composite 2 (*B. campestris* var *toria*), Varuna (*B. juncea*) were grown in fields. Plants protected from *Alternaria* blight disease by spraying mancozeb (0.2%), a contact fungicide, at the age of 35 and 65 days after sowing, were considered as healthy plants. Naturally infected plants showed disease symptoms at about 35 days after sowing.

Leaf tissue (1.0g) from healthy and diseased plants were collected at 30, 50, 70 and 90 days after sowing from the middle area of the leaves. Tissues were extracted in hot 80% ethanol. The homogenates were centrifuged at 3000g for 10

minutes. The supernatant were collected and residue was washed several times with 80% ethanol. The supernatant and washings were pooled and evaporated to dryness. The residue was dissolved in a small volume of distilled water. The supernatant was appropriately diluted and made to a volume. A portion of it were used for assay of phenols and total sugars. Phenols were estimated with Folin-Ciocalteu reagent (Spies, 1955) and sugars were estimated with the method of Morris (1948).

RESULTS AND DISCUSSIONS

The quantity of phenolic compounds in resistant cultivar (Midas) was slightly higher than the susceptible (Benoy) one (Fig. 1A). After infection the level of phenol content increased in both the cultivars. These data confirms the post-infectional accumulation of phenolics in tissue of diseased plant by earlier authors (Farakas and Kiraly, 1962; Sharma *et al.*, 1983; Vidyasekaran, 1974). Phenol accumulation decreased in resistant and susceptible cultivars at 90 days after sowing in both healthy and infected plant tissue. The level of total sugar content in resistant and susceptible cultivars after infection were presented in Fig. 1B. A fall of carbohydrate content was noticed in susceptible lines after infection but that of resistant one showed slight reduction. Decrease in carbohydrate content was observed by several authors in many plant diseases (Reddy *et al.*, 1983; Reddy

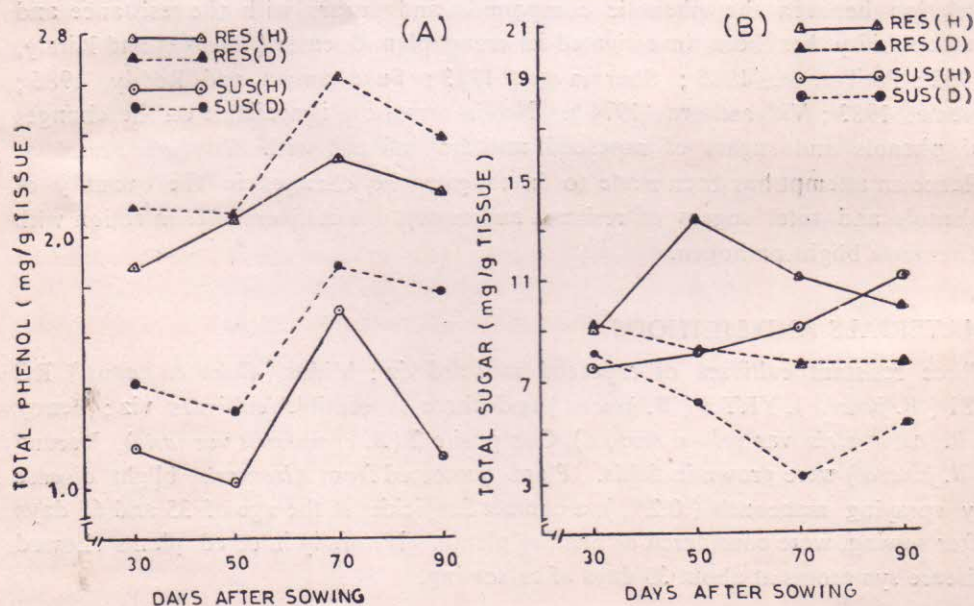


Fig. 1: Changes in (A) phenol and (B) sugar content of healthy and *Alternaria brassicae* infected leaf tissue of resistant (Midas) and susceptible (Benoy) cultivars of rapeseed and mustard.

et. al., 1984 ; Singh and Prashar, 1984). It may be noted (Fig 1A) that the quantity of phenol was maximum at 70 days after sowing. A slight increase of total sugars was observed in the susceptible cultivar at 90 days after sowing might be due to tissue taken from siliqua excluding the seeds as there was no leaves in this stage in the particular variety Benoy. One of the reason for reduction of the sugar content might be due to enhancement of synthesis of phenolics after infection (Goodman *et. al.*, 1967). However, the accumulation of phenolics in infection site was possibly due to release of bound phenol, activation of enzymes oxydizing phenolic compounds, or translocation of phenolic compounds in the infection sites. In another exepriment 70-day old plants were used to compare the phenolics and total sugars content of healthy and *A. brassicae* infected leaves of three resistant and three susceptible cultivars of rapeseed mustard (Fig. 2A

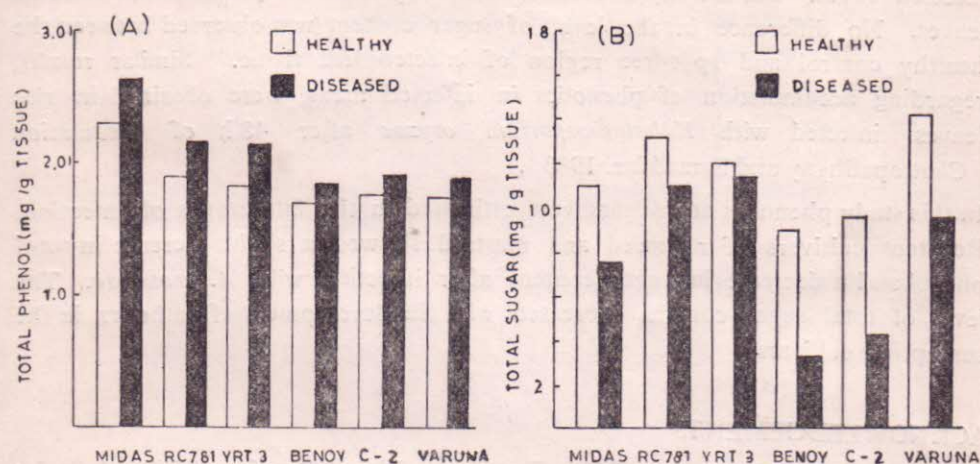


Fig. 2: (A) phenol and (B) suger content of healthy and *A. brassicae* infected leaf tissue of three resistant (Midas, RC 781 and YRT 3) and three susceptible (Benoy, Composite 2 and Varuna) cultivars of rapeseed and mustard at 70 days after sowing.

and Fig. 2B). Percent increase in total phenol in resistant cultivars after infection were 14.0, 12.0, and 16.2 from healthy control in the varieties Midas, RC 781 and YRT 3 respectively but that was slightly low (10.5, 10.0 and 9.7) in the susceptible cultivars (Benoy, Composite 2 and Varuna). A low level of total sugar content was observed in infected susceptible lines as compared to infected resistant lines. The rapid reduction in the quantity of sugars after infection might be due to direct utilization by pathogen, diversion to other compounds or due to increased rate of respiration (Inman, 1965 ; Nema, 1983).

To test the accumulation of phenolic compounds and utilization of total sugars specially in the infection site (lesion area), the phenols and sugars were estimated from spot and spot-free areas of infected leaves of cultivar RC 781 (75 day) and

were compared with that of healthy control. Results (Table 1) showed that the phenol content in the lesion areas were 14 percent more than the healthy control. There was a decrease (-7.8 percent) in total phenolics in the lesion-free region of

Table 1. Phenol and sugar content of spot and spot-free regions of leaves (RC 781) infected with *A. brassicae*.

Tissue	Total phenol (mg/g fresh wt. tissues)	Percent changes over control	Total sugar (mg/g fresh wt. tissues)	Percent changes over control
Healthy	1.78	—	16.0	—
Infected :				
Spot-free area	1.64	- 7.8	17.0	+ 6.2
Spot area	2.03	+14.0	10.0	-37.5

infected leaves. But the sugar content was very low in spot area of infected leaves. No difference in the level of sugar content was observed between the healthy control and spot-free region of infected leaf tissue. Similar results, regarding accumulation of phenolics in infected areas, were obtained in rice leaves infected with *Helminthosporium oryzae* after 48 h of inoculation (Chattopadhyay and Samaddar, 1980).

In this study phenolics and sugars were estimated in the late stages of infection. Resistant cultivars of rapeseed and mustard showed a slight increase in total phenol and a decrease in sugar content after infection with *A. brassicae*. The level of total sugar content decreased with the development of pathogen in the susceptible cultivars.

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