

Analytical Study of Leaf Surface Wax of two Barley Cultivars

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The present investigation deals with the quantitative and qualitative estimations of wax of two barley cultivars (Agra local and K₁₂) in relation to *Alternaria alternata* (Fr.) Keiseler. The amount of wax in leaves declines with the advance of age in both cultivars. K₁₂ cultivar of barley, which is partly resistant to *Alternaria alternata* has more wax than Agra local which is more susceptible to *Alternaria alternata*.

Key Words: Leaf surface wax, Barley cultivars, *Alternaria alternata*

Introduction

Many plant structures, particularly leaves and fruits have a layer of wax on the outside of cuticle. The chemical properties of the leaf surface are normally governed by the surface wax layer. The wax components of the cuticle are responsible for water proofing, cuticular respiration (Grncarevic & Radler 1967) and water repellancy (Silva Fernandes 1965). It is of great importance in prepenetration stage of pathogenic fungi (Allen 1959 and Holloway & Baker 1970). Kumar (1975) stated that wax deposition is partly responsible for causing resistance and susceptibility in plants of some wheat cultivars and differ in both quantity and quality. It was, therefore, thought desirable to ascertain the role of leaf surface wax in two barley cultivars (Agra local and K₁₂) in

relation to leaf blotch disease caused by *Alternaria alternata* (Fr.) Keissler.

Material and Method

For quantitative analysis of leaf surface wax 10, 25, 35 and 50 days old plants of the two barley cultivars were selected. The extraction of wax was done from the young (uppermost) and old (lowest) leaves of barley plants by immersing them in 25 ml. of chloroform (Martin & Batt 1958). The area of each leaf was calculated with the help of graph paper. The wax extract was centrifuged at 3500 r.p.m. for 15 minutes at 5°C to make it free from insoluble impurities and finally subjected to complete evaporation of chloroform first in hot water bath maintained at 45°C ($\pm 1^\circ\text{C}$) and finally in hot air-oven at 35°C ($\pm 1^\circ\text{C}$). The dry matter was

weighed at room temperature. For qualitative analysis, wax samples were prepared by elution of the dry matter in 5 ml. of chloroform and the composition of leaf surface wax was studied by TLC method (Holloway & Challen 1966).

Results and Discussion

The quantitative study of leaf surface wax of two barley cultivars indicated (table 1) that the maximum amount (0.0209 gm/100 cm²) of leaf surface wax occurred in young leaves of 10 days old plants of K₁₂ and minimum (0.0023 gm/100 cm²) in 50 days old leaves of Agra local cultivar. It is also obvious from the results that the leaves of all ages of K₁₂ cultivar contained higher quantity of wax than those of Agra local. The wax deposition of the leaf surface varied with the maturity and the amount declined progressively in leaves with advance in age. The maximum deposition of wax was found in young leaves in comparison to old ones.

Table 1 Quantity (grams per 100 cm²) of leaf surface wax of two barley cultivars

Age of plants (in days)	Agra local cultivar		K ₁₂ cultivar	
	Young	Old	Young	Old
10	0.0144	0.0091	0.0209	0.0101
25	0.0132	0.0078	0.0184	0.0056
35	0.0099	0.0028	0.0159	0.0054
50	0.0049	0.0023	0.0095	0.0043

The qualitative analysis of leaf surface wax showed that irrespective of age, maturity and time of collections of the samples, a total of 12 constituents of wax were detected from the leaf surface of two barley

cultivars. Nine constituents viz., unknown A (Rf=0.0335), sterol (Rf=0.1493), lupeol β -amyirin (Rf=0.257), n-secondary alcohol (Rf=0.4933), unknown B (Rf=0.34), unknown C (Rf=0.6156), n-alkene (Rf=0.951), n-hydroxy acid (Rf=0.0245) and n-fatty acid (Rf=0.0503) were seen in Agra local cultivar. Out of these, the constituent n-hydroxy acid was not present in young leaves and unknown A was absent in old leaves of all ages. The constituents like sterol, n-alkene, n-hydroxy acid and n-fatty acid were present in old leaves of all ages. The results also indicated that the constituent unknown C was present only in 10 days old leaves and unknown B restricted to 25 days old leaves. Other constituents did not show definite pattern.

Apart from nine constituents already mentioned for Agra local, three additional constituents like acetate of n-w hydroxy acid (Rf=0.731), n-alkyl ketone (Rf=0.769) and n-monosaturated fatty acid (Rf=0.0603) were also present in K₁₂ cultivar. The constituent n-monosaturated fatty acid was restricted to young leaves of all ages. While the constituents, viz. n-secondary alcohol, n-alkene and n-fatty acid were common to old leaves of all ages. The constituents like unknown C, acetate of n-w hydroxy acid and n-alkyl ketone were present in 10 days old leaves only.

The survey of barley fields in Agra region shows that Agra local is comparatively more susceptible than K₁₂. The present investigation also shows more deposition of wax and additional number of constituents in K₁₂ cultivar. Thus, the more amount of wax and additional constituents in K₁₂ barley cultivar may cause partial resistance to *Alternaria alternata*. Similar findings have been reported by Martin et al. (1957) on apple, Heather (1967) on *Eucalyptus bicostata*, Kolattukudy (1965) on cabbage, Kumar (1975) on wheat and Sharma (1977) on pea.

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*Original not seen

Source—R.P.P.