AN ESTIMATION OF THE SENESCENCE PERIOD OF EXCISED RICE LEAVES

STUDIES with exogenous application of auxins (Osborne[6], Osborne, Daphne and Hallaway[7]), gibberellins (Brian, Petty and Richmond[2], Fletcher and Osborne[3], Beevers[1]), Cytokinins (Richmond and Lang[9]), BZI (Person[8], Samborski and Forsyth[8], Wang and Waygood[11], Wang, Hao and Waygood[10]), CCC and B–nine (Halevy and Wittwer[4]) have indicated that all these substances could regulate ageing processes such as yellowing of leaves, degradation of chlorophyll, an increasing failure of nucleic acid and protein synthesis and many other biochemical processes. These chemicals were reported to have retained green colour either in excised or intact leaves in many deciduous plants. The period of retention of the green colour in leaves seems to have a relation to the yield in cereal crops (Misra and Khan[5]). As little is known of the effect of many growth regulators on the leaf senescence in cereal crops, the present investigation is undertaken to elucidate the influence of two auxins, one gibberellin, one growth retardant and one imidazole on the regulation of leaf senescence in excised leaves of *Oryza sativa*, a cereal crop for more than half the world population.

Oryza sativa L., cv. 'Jagannath', a mutant of cv. T 141 through X-ray irradiation, was chosen as material for experimentation. This is a season bound and high-yielding variety and is widely cultivated in Orissa. Rice seedlings raised from soaking pure line seeds of this rice strain were grown in the experimental pots (25 × 25 cm). The entire third leaf which was found healthy and fully expanded was collected from the 30-day-old seedlings. The leaves so collected were floated separately on 50 ml of the aqueous solutions of Indole acetic acid (IAA), 2, 4–Dichlorophenoxy acetic acid (2, 4–D), Gibberellic acid (GA_3), 2–Chloroethyl–trimethyl–ammonium chloride (CCC) and Benzimidazole (BZI), each at a concentration of 5, 10, 15, 20, 25, 50 and 100 mg/l. One set of leaves floated on 50 ml of double distilled water served as control. There were 50 leaves in each set. All the petridishes were kept in the dark at 28° C ± 1° C for incubation. Time taken for complete change of leaf colour from green to yellow was recorded in all the sets.

A change in the natural colour of the leaves, through transitional colours, to yellow occurred centrifugally in excised rice leaves kept in the dark floating in petridishes containing distilled water or a chemical solution. BZI, at each concentration tried, caused a significant inhibition in senescence; the higher the concentration of the chemical, greater was the inhibition in senescence. BZI solution (50 or 100 mg/l) brought about significant inhibition of the same magnitude in comparison with the controls. BZI proved to be the most effective senescence inhibitor of all the chemicals used. GA_3, too, significantly caused an inhibition, it being more marked with increasing concentrations of the chemical. GA_3, thus, acted as a less effective senescence inhibitor than BZI. CCC at a concentration of 5 mg/l caused no effect while at 10, 15, 20, 25, 50 and 100 mg/l, it inhibited senescence respectively by 2, 3, 6, 7 and 8 days over the controls. Senescence inhibition at 100 mg/l was the same as recorded in leaves treated with 50 mg/l strength CCC, thus, acted as a less effective senescence inhibitor than GA_3 or BZI. 2, 4–D at low concentrations of 5 or 10 mg/l did not produce any effect on senescence, but at higher concentrations, it brought about a significant inhibition in the senescence proportionate to the strength of the test solution. Thus, 2, 4–D acted as a milder senescence inhibitor than CCC. IAA at low concentration of 5, 10, 15 or 20 mg/l did not produce any effect different from controls. Further increase in the concentration of the chemical inhibited senescence in comparison with the controls. Thus, IAA proved to be a weaker senescence inhibitor (Table I). The effectiveness of the chemicals in senescence inhibition was IAA < 2, 4–D $< GA_3 >$ CCC $<$ BZI.

TABLE I

Number of days taken by the excised leaves of Oryza sativa, *after treatment, for attaining complete senescence*

(Average of 50 leaves)

Concentration of chemical (mg/l)	Chemicals					Mean
	IAA	2, 4-D	GA_3	CCC	PZI	
5	10	10	12	10	13	11·0
10	10	10	15	12	16	12·6
15	10	12	18	13	19	14·4
20	11	14	21	16	24	17·2
25	12	15	23	17	25	18·4
50	13	16	25	18	27	19·8
100	14	16	26	18	27	20·2
Mean	11·42	13·28	20·00	14·85	21·58	

Note: LSD for concentration at 1% level = 1·65. for chemical at 1% level = 1·53 and for interaction (chemical × concentration) at 1% level = 2·70, Number of days taken by rice leaves floated on distilled water (control) was 10 (mean).

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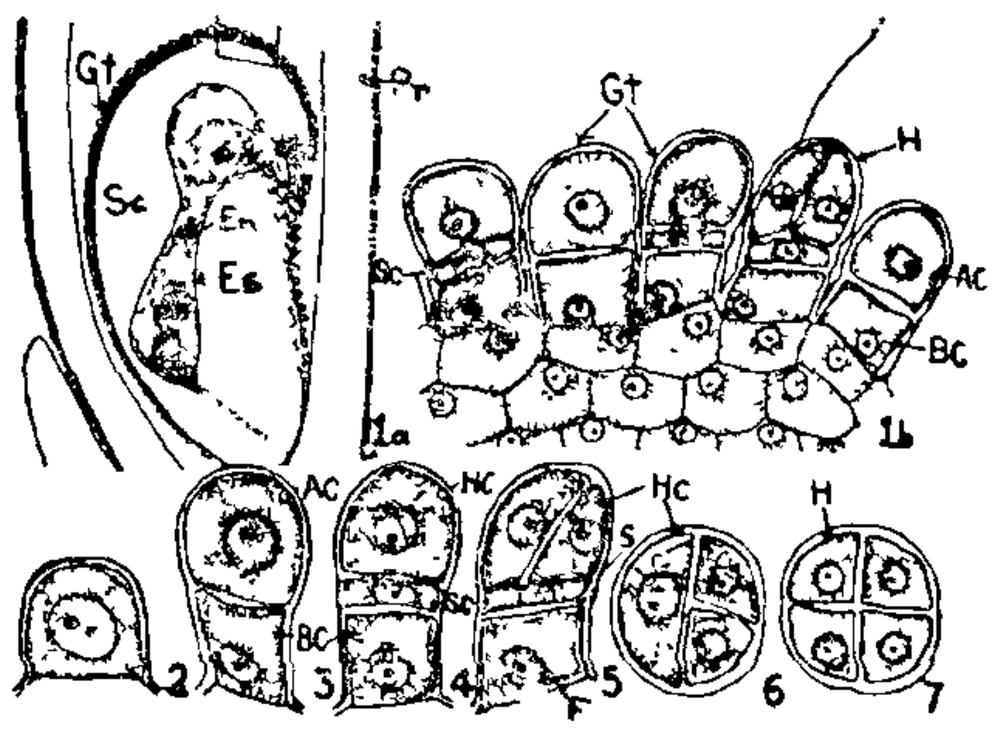
ONTOGENY, STRUCTURE AND DISTRIBUTION OF GLANDULAR TRICHOMES ON OVULAR SURFACE OF *LEUCAS URTICAEFOLIA* BR.

SEVERAL recent studies have emphasised the utility of trichomes in taxonomic delimitations of many taxa (Uphof[10], Inamdar[4], King and Robinson[5 6], *etc.*,). The information regarding the various types, Organographic distribution and ontogeny of trichomes in different families of angiosperms is very meagre and often confusing tspecially in members of Lamiaceae. This communication deals with the structure, development and distribution of glandular trichomes on ovular surface of *Leucas urticaefolia* a member of Lamiaceae. In this taxon both glandular and non-glandular trichomes are present on stems, leaves, inflorescence axis, pedicel, calyx, corolla, anther wall, carpels and the gynobasic part of style. The formation of four celled glandular hairs after fertilization on the ovular surface of *L. urticaefolia* has been noticed by the present authors. These glandular hairs persist for a long time during development of endosperm.

A glandular trichome develops from a protodermal cell which is soon distinguished from other cells by its larger size, dense cytoplasm and conspicuous nucleus (Figs. 1*a*, 1*b*). The initial cell becomes papillose and vacuolated and protrudes beyond the outer surface of ovular (seed coat) epidermis (Fig. 2). The protodermal cell divides by a periclinal wall resulting in formation of an apical cell (AC) and a basal cell (BC) (Figs. 1*b*, 3). The former divides periclinally to form an upper large head cell (HC) and a lower small stalk cell (SC) (Figs. 1*b*, 4). At three celled stage, the head cell (HC) becomes globose and undergoes two vertical divisions at right angles to each other to form a four celled head (H) (Figs. 6, 7). Occasionally the head cell may show oblique division (Fig. 5). The basal and stalk cells do not divide and form a one celled foot (F) and stalk (S), respectively.



FIGS. 1–7. Ontogeny of glandular trichomes. 1*a*. L.S. of Carpel—early endosperm (En) development, Gt (Glandular trichomes), Sc (Seed coat), Es (embryosac), Pr (Pericarp); 1*b*. Developmental stages of (Gt); 2. Protodermal trichome initial; 3. Apical cell (AC) and basal cell (BC); 4. Head cell (HC). stalk cell (SC) and (BC); 5. Oblique division of HC. Stalk (S) and foot (F). 6: Vertical division in (HC); 7. Four celled head (H).

Scrophulariaceae is also characterised by the possession of glandular trichomes in which the head is formed by vertical divisions only (Solereder[9]). The authors observed a similar condition in *L. urticaefolia* in which head is four celled structure. However, two celled glandular heads on the ovular surface after fertilization have been noticed in *Leucas aspera* by Murthy[8].

The plant hair types have been successfully used in the classification of genera and even of species in certain families and in the identification of interspecific hybrids (Cowan[1], Heintzelmann and Howard[2], Hummel and Staesche[3], Metcalfe and Chalk[7]), similar comparative ontogenetic studies of the trichomes in the Lamiaceae may prove useful for taxonomic consideration.

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