The ubiquity and diversity of phenolic compounds in nature is well documented. They occur at high concentrations in plant tissues, micro-organisms, soils and as has been demonstrated recently, also in industrial effluent wastes.

In recent years, an increasing interest has been shown in these naturally occurring secondary plant substances. Whereas, hitherto, knowledge of such substances was advanced, mainly by the work of organic chemists interested in natural products, more recently, many of the classes of phenolic compounds have attracted the attention of biochemists, plant physiologists, pharmacologists, plant pathologists and taxonomists.

The plant flavonoids, mainly because of their intense colours but also for a variety of other reasons, continue to attract the attention of scientists from many different disciplines; and yet no clear-cut evidence regarding their role in plant growth and metabolism of this important group of pigments is available.

The biosynthetic versatility of plants in producing a whole series of interrelated substances, and the pattern
with which they are synthesized and degraded into various end-products at different developmental stages, has shown that phenols are metabolically active and by no means inert "End-Products" of cellular metabolism as they were once thought to be.

As E.C. Bate-Smith has said, the flavonoids are "privileged compounds" as taxonomic markers among the many different types of natural constituents and it is surely no accident that Holger Erdtman chose to look at flavonoids in his classic survey of pine-heart woods.

The current interest in the flavonoids obviously lies in relating their molecular structure with biological function and in determining more precisely their role in plant metabolism.

In many cases the functional significance of phenolic compounds of biological origin, may be quite apparent. For example, cinnamic acid derivatives serve as intermediates in the biosynthetic pathways leading to flavonoids (Harborne, 1967a); lignin (Higuchi, 1971), and other compounds. There are, however, at the same time, a vast number of phenolic derivatives to which no specific function can be ascribed.
The material more favourable for physiological experiments is the young seedling known to accumulate pigment in some quantity. The growth of a seedling in the dark and in light differs substantially. In the dark, hypocotyl is elongated, cotyledons are folded and mostly devoid of pigments i.e. the seedling is etiolated. On the other hand, in light, the hypocotyl becomes short and thick with unfolded cotyledons and pigments are synthesised i.e. de-etiolation takes place.

Apart from chlorophyll and carotens, the large variety of pigments, which are responsible for the colour of flowers, bracts, some fruits and also some leaves, are flavonoids.

Flavonoid synthesis has been shown to be light dependent in every plant tissue that has been so far studied and this would seem to be the general rule.

The order centrospermae of the plant kingdom is distinct from the rest of angiosperms in that in this group, anthocyanins, the flavonoid pigments, are replaced by another group of plant pigments known as betalains having an altogether different chemical nature and structure. (Marbry, 1966). Indeed, it is recognised (Kimler et al., 1970),
that the two classes of plant pigments are mutually exclusive although their distribution in vegetative and reproductive parts of the plant and also responses to various stimuli follow the same pattern.

Wolf (1960), found that gibberellic acid strongly reduced the formation of chlorophyll in light. Evidence is accumulating that the inhibitory effect of light on stem growth and the genetic control of stem growth result from a control over the response of the tissue to gibberellin rather than alter gibberellin biosynthesis (Kende and Lang, 1964; McComb and McComb, 1970). Such control over the tissue sensitivity may result from increased levels of inhibitory substances. Thus, we must consider not only the levels of endogenous gibberellin but also the levels of inhibitors. Lockhart (1963), thought that light may cause stem growth inhibition by producing an inhibitor. The literature abounds with papers which report that treatment with gibberellin completely or almost completely overcomes the inhibition of stem growth by red light (Lockhart, 1956, 1959; Sale and Vince, 1960; Russell and Galston, 1969).

Recently Demos et al. (1975), have shown the inhibitory effects of ten phenolic compounds on hypocotyl growth of
The mung bean. They have reported that tannic, genetisic, p-coumaric and vanillic acid inhibit the hypocotyl growth. Ferulic, caffeic, $p$-hydroxybenzoic and syringic acids also showed a significant reduction in hypocotyl growth of the mung bean.

Marige et al. (1975), have also shown that the levels of polyphenol and growth could be related in tomato plants. They have observed that exogenously supplied quinic acid reduced the growth of the plant and that the decrease in size is proportional to the stimulation of the phenolic pool.

Recently tannins have been reported as antagonists of GA (Corcoran et al., 1972). Fourteen crystalline hydrolyzable tannins and six impure mixtures of condensed or hydrolyzable tannins were found to inhibit the GA-induced growth of dwarf pea seedlings. The endogenous growth of dwarf or non-dwarf pea seedlings was not reduced. Both IAA and GA$_3$ cause elongation, but only that induced by GA$_3$ was inhibited.

It has been suggested that flavonoids may control the rate and patterns of growth by their effect on IAA destruction (Galston, 1969). There are also reports that
different flavonoids act as co-factors or inhibitors of IAA oxidase and thus act by regulating the auxin level (Mumford et al., 1961; Furuya et al., 1964; Stenlid, 1963). However, it is realised that flavonoids can intervene in growth in other ways as well (Stenlid, 1962; Galston, 1969).

Polyphenols have a direct effect on IAA oxidation, which can also be catalyzed by some of the plant peroxidases. Thus, peroxidases and polyphenol oxidase are capable of catalyzing the oxidation of polyphenols.

Peroxidase has been implicated in a number of diverse phenomena observed in plants (Shannon, 1968). In recent years, peroxidase activity in the tissues of a variety of plants has been investigated. Studies pertaining to numerous biochemical, physiological, phylogenetic and ontogenetic relationships have generally shown that this enzyme(s) varied both qualitatively and quantitatively from organ to organ, but some peroxidases were common to several organs (Galston et al., 1969; Smith et al., 1971; Sheen, 1973; Thomas et al., 1974). Furthermore, the distribution and concentration of peroxidases changed during the growth and development of plants. Quantitative changes of oxidases and polyphenols at a given developmental stage may therefore have morphogenetic significance.
A close scrutiny of the foregone analyses suggested that these were likely to lend themselves to some interesting study of the effects of phenolic substances, both individually and in their interaction with GA$_3$:–

i. on the growth of seedlings in both dark and light;

ii. on betacyanin biosynthesis;

iii. on peroxidase activity – to understand their mechanism of action on growth; and

iv. on ascorbic acid-utilization in the light of their propensity to prevent the oxidation of ascorbic acid.