CHANGES IN STEROLS DURING FLORAL DEVELOPMENT IN
HORDEUM VULGARE L., LOLIUM TEMULENTUM L. AND XANTHIUM STRUMARIUM L.

by

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Thesis submitted for the Degree of
Doctor of Philosophy

December, 1982
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SUMMARY

Changes in sterol composition were examined during floral development in three different plant species, *Hordeum vulgare*, *Lolium temulentum* and *Xanthium strumarium*, to explore various aspects of the involvement of sterols in flowering and reproductive growth. Sterols in free, esterified and glycosylated forms were isolated separately in the reproductive (shoot apex) and the vegetative tissues (stem, leaves, etc.) of the plant. The mass spectra of all sterols matched significantly the mass spectra of authentic sterols. In all three species, the four major sterols were sitosterol, cholesterol, campesterol and stigmasterol, and the sterol levels in the shoot apex were much higher than those in the other parts of the plant, suggesting that active sterol synthesis occurs in young and meristematic tissues during growth processes.

Compared to the other parts of the plant, the sterol composition was also different in the shoot apex. The major difference was the presence of unusually high levels of cholesterol in young vegetative and early flowering apices of all three species, indicating that cholesterol is as much a major plant sterol as any other and may have a relatively specific association with meristematic and/or reproductive tissues. During floral development the percentage of total cholesterol decreased while that of certain 24-alkyl sterols increased. Thus, cholesterol may act as a precursor of other sterols during differentiation of the shoot apex.

Although all sterols did not undergo similar changes, the changes in a particular sterol, in a particular region were generally the same in all three species. The major effect of transition to flowering was the occurrence of a temporary increase in the free 24-alkyl sterols in the aerial vegetative tissues, coinciding with the start of floral differentiation at the shoot apex. In some tissues steryl esters and steryl glycosides also increased temporarily; however, the increase in esters was always 24 hours before the increase in free sterols, and in glycosides always 24 hours after the increase in free sterols. Similar changes could not be detected in the reproductive shoot apex of either *Lolium* or
barley. However, in the shoot apex of *Xanthium* these effects were detected, although they could have been due to the inclusion of surrounding vegetative tissues with the apex. Thus, floral differentiation of the shoot apex was reflected in terms of sterol changes in the vegetative parts of the plant. This was further substantiated by the observation that these changes in sterols were independent of the growth conditions and always accompanied the same developmental changes.

Of the two possible roles for sterols, an hormonal role in flowering, as suggested by some workers, was not supported by the data. A membranous role is discussed as a more likely possibility. A storage role, eventually leading to the synthesis of other sterols, is most likely for steryl esters and was also supported by the data from barley seeds. Because of their very low levels, a significant storage role is not possible for steryl glycosides. It is postulated that the changes associated with floral development may be mediated, at least partly, through changes in sterols which act by affecting both structural and dynamic properties of membranes in different tissues.