ON BIBRACT SHOOTS

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Figure 1 is a schematic of an inflorescence of *Cotoneaster franchetii* (Rosaceae), a garden shrub in the pink-flowered section of the genus. We notice first of all that every shoot terminates in a flower: the inflorescence is determinate. Each node bears a single bract, or in the lowest case a leaf, the arrangement known as alternate. The lengths of the successive first order shoots (which spring from the main stem) in internodes are 6, 5, 4, 3, 3 and 3 in order from the base. All the shoots which spring from the first order branches have length 3 and bear two bracts. If any shoots spring from the axils of those bracts, they also have length 3 and bear two bracts. In Robinson (1986 and 1992) I called these *bibract shoots*. I have not seen the word in this form elsewhere, but the word *bibracteate* is used in Webb *et al.*, as will be quoted later. I do not use the term bibract where the bracts are exactly opposite.

Bibract shoots occur not only in this species but throughout the genus and the related *Crataegus* (hawthorn) and *Pyracantha* (firethorn). Elsewhere in the Rosaceae they occur in *Geum, Rubus* (raspberry, blackberry etc.), *Fragaria* (strawberry) and *Rosa* (rose, including the cultivars) and many other genera. All these may well have a common origin. On the other hand, bibract shoots do not seem to occur in the genus *Prunus*.

One difference between such genera as *Cotoneaster* and *Geum* is that in the former the transition from leaf to bract is abrupt, with seldom more than one intermediate structure, while in *Geum* there is a gradient of simplification from the basal rosette leaves to the highest leaves on the plant. I would be prepared to use the term bibract where the structures borne are leaves.

Bibract shoots also occur in other families, such as:

Actinidiaceae:	*Actinidia* (kiwifruit)
Campanulaceae:	*Campanula poscharskyana*
Escalloniaceae:	*Escallonia*
Linaceae:	*Linum*
Papaveraceae:	*Eschscholzia*
Polemoniaceae:	*Phlox*
Ranunculaceae:	*Ranunculus, Aquilegia, Helleborus*
Scrophulariaceae:	*Phygelius*
Violaceae:	*Viola*

The way bibract shoots occur in these inflorescences varies somewhat: Figure 2 shows four schematics illustrating something of this variation. In *Viola*, for example, there is never any growth from these bracts. It is in describing this genus that Webb *et al.* use the term 'bibracteate'.

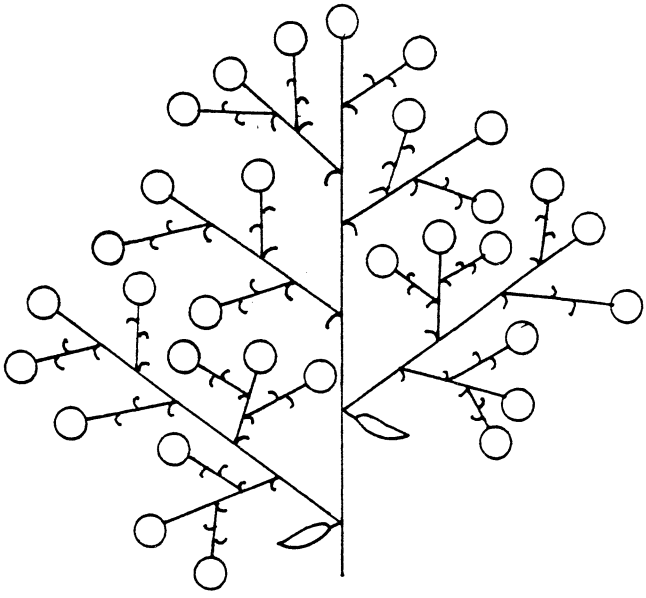

Figure 1 Schematic of an inflorescence of *Cotoneaster franchetii*

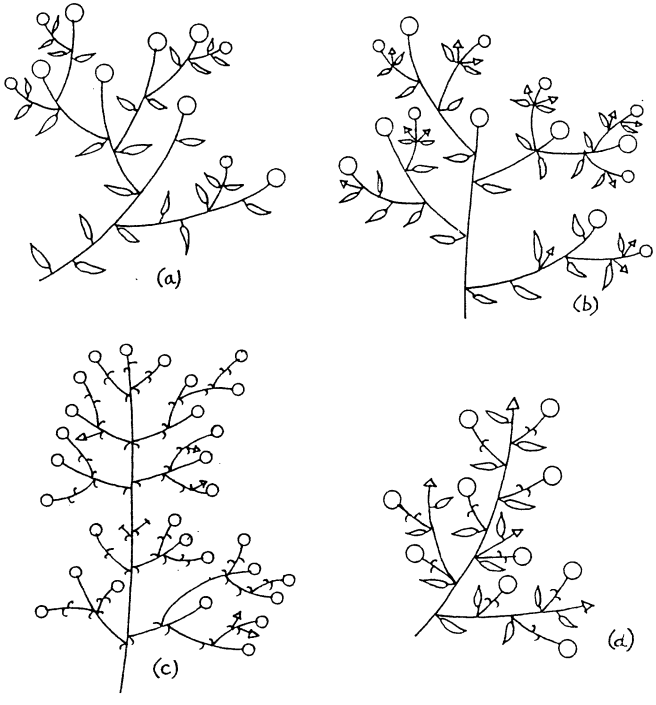

Figure 2 Schematics showing occurrences of bibract shoots in (a) *Geum coccineum*, (b) *Ranunculus parviflorus*, (c) *Phygelius capensis*, (d) *Viola riviniana*

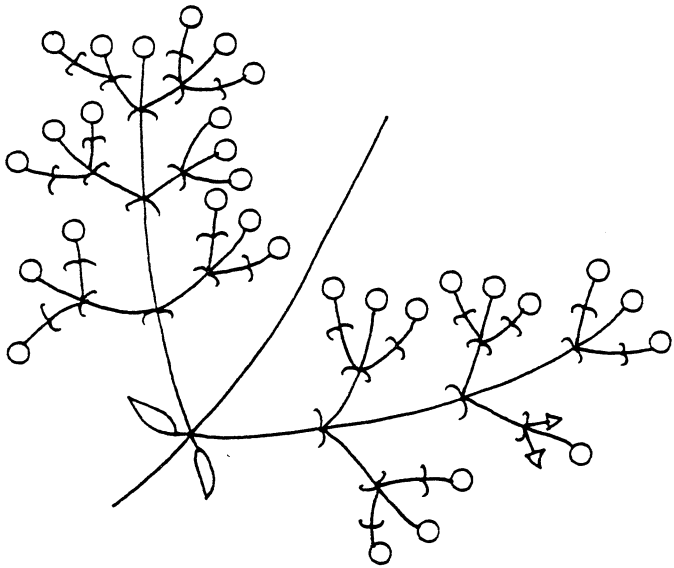

Figure 3 Schematic of part of an inflorescence of *Clematis vitalba*

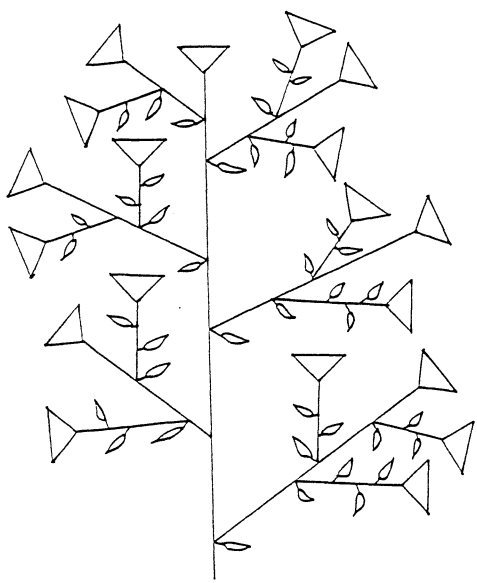

Figure 4 Schematic of a plant of *Daucus carota*

The first impression given by an inflorescence such as *C. franchetii* is that the bibract shoot reaches its prominence simply because the growth controls do not allow a peduncle with only one or no bracts, but if this were the case we would expect some specimens in which the bound was breached.

There is also evidence from the ratios of the lengths of the three internodes, basal : middle : distal. In *C. franchetii* I found a ratio 55 : 15 : 30; while in *Geum coccineum* it was 63 : 5 : 32. There is thus a tendency for the middle internode, between the bracts, to be much the shortest. This suggests that the bibract shoot is derived from a dichasial cyme, with each shoot having one node, bearing two opposite bracts, by loss of synchronisation of the production of the bracts. In Rosaceae I know of no plant with opposite leaves or bracts, but in Ranunculaceae there is at least the genus *Clematis* in which all leaves and bracts are opposite. There are certainly also plants where at the base of a shoot the leaves are opposite, but further up synchronisation is lost and the leaves become alternate, often with still unequal internode lengths. The upright members of the genus *Epilobium* are an example. Figure 3 shows a section of the inflorescence of *Clematis vitalba* (old man's beard).

Another situation in which the term bibract shoot might be used, but obviously with a different origin is in certain members of the Apiaceae (Umbelliferae), including the carrot *Daucus carota*. A schematic is shown in Figure 4. Here the bibract shoots terminate in the double umbels. That the origin might not only be separate but of a different kind is suggested by the observation that at the very top of the plant there seem to be some shoots with only one bract.

There is clearly a need to extend the range of observation of this phenomenon, and I would appreciate having readers drawing other species to my attention.

REFERENCES

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