Development and growth of plant

Roux model

Example of the coffee tree

Natacha MOTISI[a]

Philippe de REFFYE[b]

Glossary

Vegetative axis: succession of phytomers produced by meristems.

Development axis: defined by the succession of development default (no organ produced) and development successes. During development cessation, growth continues.

Physiological age: Relates to the degree of differentiation of the structures produced by the meristem. It can be defined by a combination of morphological, anatomical and functional attributes of resulting entities.

By convention the physiological age of the trunk is 1 and the physiological age of branches is 2.

Development cycle: Unit in number of phytomers of step allowing the production of phytomers of the same generation

Phytomer: Botanical entity formed by a node, associated with its leaf (or leaves) and axillary bud(s) plus the subtending internode.

[a]CIRAD, UPR Bioagresseurs : Analyse et Maîtrise du Risque. natacha.motisi@cirad.fr

[b]CIRAD, UMR AMAP. philippe.de_reffye@cirad.fr

Roux architectural model (descriptions and definitions from P. de Reffye thesis [1])

Definition of the Roux Model

The trunk is a monopodial orthotropic axis which shows continuous growth, the plagiotropic branches are inserted continuously. Flowering is lateral on the branches. (Hallé et al. 1978 Fig. 1).

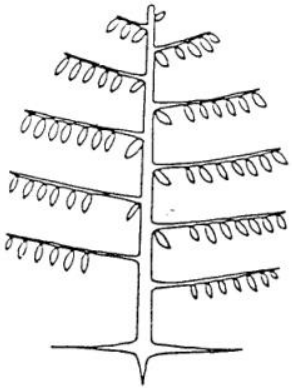


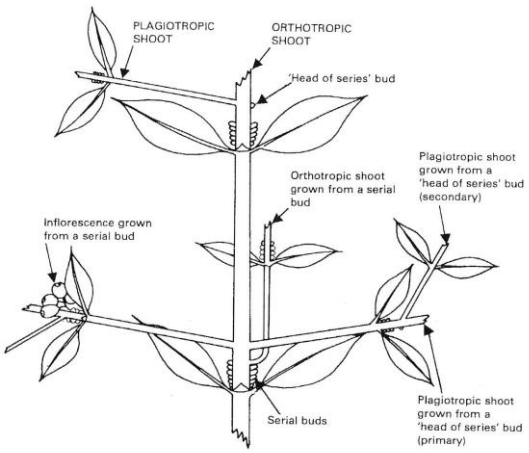
Figure 1. Roux model

Example of Roux model: the coffee tree

Coffee tree architecture is classified as a Roux model. The trunk is an orthotropic monopodia (Fig. 2). Each node bears two opposed plagiotropic branches with immediate development. The flowering is lateral on the branches and appears fleetingly after sufficient rainfall happening after the dry season. On each node of axes, supernumerary buds can develop into an axis with delayed development named secondary axis.

For robusta tree generally less than 10% of the phytomer are from secondary axes and the phenomenon is often negligible.

Figure 2. Shoot morphology of Arabica Coffee (Clifford, 1985)[2]



[1] **Verchere de Reffye P.** (1979). Modélisation de l'architecture des arbres par des processus stochastiques. Simulation spatiale des modèles tropicaux sous l'effet de la pesanteur. Application au *Coffea Robusta*. Thèse soutenue le 17 septembre 1979, Université Paris Sud Centre d'Orsay, n° d'ordre 2193.

[2] **Clifford MN, Willson KC, Cannell MGR** (1985). Physiology of the Coffee Crop. In. Coffee. Springer US, 108-34.