

*Discussion of results.*

A scrutiny of all the recorded observations regarding paddy-seedlings pulled out on a particular day, and planted in six consecutive daily batches, points to the conclusion that the establishing-capacity of seedlings is seriously impaired, if pulled-out seedlings should be kept for more than three days prior to transplanting. It is noteworthy that the vegetative growth of the surviving seedlings (as evidenced by tillering and flowering characters) does not appear to be affected adversely by the delay up to 6 days in planting. However, since the yield of a paddy-field may be mathematically expressed as the product of the number of the standing plants in the field and the average yield per plant, the diminution in the 'percentage of establishment' after transplantation will naturally involve a decrease in the output of grain. Hence, it does not seem advisable to delay the planting of seedlings pulled out from nurseries by more than three days.

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**BOTANY OF SOME USEFUL PLANTS—I.**

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The family Leguminosae (the family of the pulses, grams and beans) is of very great economic importance. It occurs both in the tropics and in the temperate regions and has a worldwide distribution. The family comprises herbs, shrubs and trees. The leaves are alternate, stipulate and mostly compound. The flowers are nearly always arranged racemosely and are hermaphrodite or polygamous, irregular or regular. The fruit is a legume. The seeds are exendospermous, the cotyledons being thick and rich in food materials. They are noted for their longevity.

The members of this family are comparatively rich in proteins and hence tend to balance the food ration of man and domestic animals. The protein is present all through the plant being concentrated in the seeds. Agriculturally, the family is of great value as a green manure. They leave a considerable quantity of avttone geiafter harvesting and thus add plenty of organic material

to the soil. The roots bear a number of small swollen structures called nodules on them. These are full of a bacterium called *Pseudomonas radiculicola* which is capable of fixing free atmospheric nitrogen. This is partly utilized by the growing plant and when the roots decay the rest is left in the soil in the form of nitrates which add to the nitrogenous fertility of the soil. On account of this leguminous crops are regularly employed as rotation crops with cereals and root crops, and as cover crops.

The family is divided into three suborders:—Papilionaceæ, Cæsalpineæ and Mimoseæ.

#### *Suborder—Papilionaceæ.*

The flowers are characterised by the papilionaceous corolla consisting of a posterior large showy petal known as the standard or vexillum, the two lateral or wing petals (alae) and the two anterior petals mostly fused to form a boatshaped structure called the keel or the karina. The keel encloses the androecium which consists of ten mona or diadelphous stamens and the gynoecium which lies inside the staminal tube.

#### *Cyamopsis tetragonoloba.*

(formerly known as *C. Psoralioides*.)

The cluster bean (Tam: Koth-Avarai) is cultivated almost throughout India. It is believed to be an introduced plant as it has never been found growing wild in India. It is mostly grown as a mixed crop or as a hedge or shade plant. In Northern India it is a field crop, while in Southern India it is grown only in gardens; two forms are often met with in the South which are differentiated by the size and color of the pods. The seeds are sown with the rains and the plants come into bearing in about 3 months.

It is a robust, erect, bushy annual growing to a height of 2 to 3 feet, while some varieties grow up to 10 feet. The stem is ribbed, fibrous, hollow and covered with adpressed mid-fixed hairs. The leaves are alternate pinnately trifostlate, stipulate, stipules being linear and petiolate, the petiole being grooved on the upper surface. The stipels are absent. The leaflets are ovate or elliptic with an irregularly toothed margin, acute pinnate—reticulate and hairy with midfixed hairs.

The flowers are arranged in axillary condensed racemes. These are purplish and bracteate with small caducous bracts, the bracteoles being absent.

The calyx is gamosepalous, very hairy, persistent with 5 unequal linear teeth, the anterior ones being larger.

The corolla is purple with the standard orbicular and short-clawed. Wing petals are oblong and nearly as long as the standard and half as broad: the keel petals are as long and as broad as the wing petals, free at the bottom and connate at the tip.

The stamens are 10 in number, monadelphous with uniform oblong anthers which are distinctly apiculate. The ovary is superior, hairy, sessile, one carpelled and one celled with five to seven ovules. The style is bent at the tip and the stigma is capitate.

The fruit is a legume elongated and tapering to a point at the apex, obscurely foursided and with light constrictions between the seeds. The latter vary in number from five to seven and are oblong, exendospermous, rich in protein and varying in colour.

The young pods are used as a fresh vegetable or dried, salted and preserved for use when it is not possible to get fresh pods. The old pods are very fibrous and hence not used. The whole plant forms an excellent cattle fodder for which purpose it is sown as a dry crop in Northern India. On account of the large amount of nitrogenous matter the plant contains and its being comparatively free from fibre when young it is very useful as a green manure.

#### *Sesbania grandiflora.*

The Agathi (as it is commonly known) is cultivated in and around betel-vine gardens while isolated plants are found round many of the Hindu houses. It is supposed to be not indigenous. It is a small erect quickly growing soft wooded tree reaching 20 to 30 ft. high. Younger parts of the stem are covered with a dense coating of short hairs (tomentose).

The leaves are paripinnately compound, alternate and pulvinate with deciduous stipules. The upper surface of the petiole is slightly grooved. Leaflets are either opposite or alternate, stipellate with short cushioned stalks, oblong in shape, entire, obtuse with a sub-mucronate tip and pubescent,

The flowers are in axillary racemes. These are yellowish white, or red in colour, very large being 10 c. m. long from the joint of the pedicel, bracteate and bracteolate. (both deciduous) with the petals slightly fleshy.

The calyx is gamosepalous, bell-shaped and broadly two-lipped, the upper formed of two connate lobes and the lower of three.

The standard is clawed, greenish yellow outside with pink colour mixed with yellow inside with a green spot at the bottom and rounded, wings are as long as the standard, clawed and yellowish white in colour. Keels are fused throughout excepting at the apex and the base, as broad and long as the wings yellowish white, with apex turned up.

The stamens are 10 in number, diadelphous (9 and 1) of unequal heights; filaments are fused to very near the tip; anthers basifixed, elongated, with longitudinal dehiscence. There is a prominent disc of green glands round the ovary.

The ovary is one-celled, sessile, and very much elongated with a short style and blunt stigma. The pods are pendulous, elongated and slender with many reddish brown seeds.

The leaves, flowers and young pods form favourite articles of food being prepared into curries. Orthodox Hindus make it a point of using the leaves of this plant particularly on the Dwadasi day (12th day after the full or new moon). The leaves form an excellent fodder for cattle especially for milch cows. In betel gardens the stem is used as a support for the vines. The leaves are used as green manure. Some medicinal properties are attributed to this plant. The leaves form a good laxative and are also recommended for ulcers in the mouth.

#### *Arachis hypogaea.*

This is commonly known as groundnut or peanut (and in Tamil as Nilakkadalai or Manilakottai). It is a native of Brazil and was introduced into India about 150 years ago. Though cultivated in small areas in many parts of India, it is grown on a commercial scale in the provinces of Madras and Bombay. In Madras the chief centres of production are South Arcot and Coimbatore districts. This is generally a 5 to 7 months crop extending from June-July to October-January. A number of

varieties are present, some being low and prostrate and others upright and differing from one another in the number of seeds in the pods.

This is a spreading herbaceous annual branching profusely all round, growing up to 1 foot high and spreading with a diameter of 2 to 3 feet.

There is a tap root 6 to 10 inches long with few lateral roots with a number of bacterial nodules in them. Adventitious roots develop from the basal portions of the stem which are covered with soil. Root hairs develop very rarely. The branching of the stem commences from the axils of the cotyledons.

The stem is round at the base and angular in the young parts and is densely hairy—long hairs (hoary). The leaves are alternate with two pairs of leaflets, stipulate, stipules very long and adnate to the base of the petiole for nearly half the length, 30-35 m. m. long, linear-lanceolate. The petiole is pulvinate the pulvinus is formed just above the junction of the petiole and stipule grooved on the upper surface and hairy. Stipels are absent. Leaflets are provided with short cushioned stalks, elliptic-obovate, entire, shortly mucronate and margins fringed with hairs. They are leathery pinnate-reticulate and glabrous.

The flowers are axillary, either occurring singly or in pairs and sessile. There are two bracteoles each being two lobed. The corolla is orange colored and the flowers in the upper axils do not develop generally.

The calyx is gamosepalous developing into a long narrow tube expanding at the top into two portions (1) the posterior broad with 4 teeth and (2) 1 lobe developed anteriorly or to a side, green and hairy.

The corolla is much exserted and carried on the calyx tube; the standard is orbicular orange colored with a short claw: wings as long as the standard, yellow in colour; keel petals united and narrow, yellowish white and with a slight twist.

The stamens are monadelphous; usually 8 stamens develop. They are dimorphic, of unequal lengths, the longer ones with rounded anthers and the shorter ones with oblong and larger anthers; stamens are borne on the tip of the calyx tube.

The superior ovary is situated at the bottom of the calyx tube, sessile at first, with a long filiform style which is bent with a

bearded stigma. After fertilization the torus elongates into a very long stalk and pushes the developing ovary into the soil. This stalk responds to positive geotropic stimulus and thus enables the development of the pod in the soil.

The fruit is a legume with a corrugated pericarp or shell, almost cylindrical with the number of seeds varying from 1 to 4 in different varieties. The shell is slightly constricted between the seeds.

The kernels when roasted form an excellent food and are used as an ingredient in many sweets. An oil is extracted from the kernel, the percentage of oil being about 45 to 50. This oil is used in various ways, as a salad oil, for adulteration with ghee and gingelly oil and in the manufacture of several kinds of soap. The cake left after the expression of the oil forms an excellent stock feed and a valuable manure.

#### *Cicer arietinum.*

The common Bengalgram (known in Tamil as Kadalai) or chickpea is grown extensively all over India. It is a native of South West Asia and has been cultivated in India from remote times. It is largely grown in Agra and Oudh. "A line drawn from Bombay to Patna would approximately divide India into two sections the northern being the great grain area while the southern is that in which it is a very subordinate crop." In Madras about 150,000 acres are under this crop chiefly in North Arcot and Coimbatore districts. It is sown about the month of October and harvested in February-March. It thrives well in soil suited for wheat and linseed. It has a tendency to smother weeds in the fields. Several fairly distinct forms exist varying in the color and size of the flowers and seeds.

It is a small spreading herbaceous annual growing to a height of 1 to 1½ feet branching profusely the branches being divaricate from the base. There is a taproot 6 inches to 12 inches long with generally 4 rows of lateral roots. Bacterial nodules are present the number of which varies according to the nature of the soil.

The main stem is rounded while the branches are four-sided, ribbed, green and densely clothed with glandular hairs. The stalks of the glandular hairs are formed of a row of cells, the gland itself being the terminal cell which is pretty large, oval and hyaline.

The leaves are oddpinate, alternate, with the number of leaflets varying from 11 to 18, stipulate, stipules leafy and serrate and petiolate, petioles being furrowed on the upper surface. The leaflets are alternate or subopposite, six millimetres long and 4 millimetres broad, ovate, serrate, acute, covered with glandular hairs and hence somewhat sticky, pinnate reticulate and without stipels. The dew collected over the leaves has an acid taste due to the secretion of the glands.

Solitary flowers are formed in the axils of the leaves and are stalked, bracteate and bracteolate, bracteoles larger than the bract. The flower stalk is articulated.

The calyx is gamosepalous densely clothed with glandular hairs, persistent, with one anterior lobe, two lateral and the 2 posterior subconnate, lobes sublanceolate.

The corolla varies in color; the standard is obovate with a number of colored forking veins proceeding from the centre to top; the wing petals are nearly half as broad as the standard, clawed and spurred; the keel petals are nearly half as broad as the wing and as long as the standard, clawed and free.

There are 10 stamens which are diadelphous (9-1); anthers are two celled, orange colored and basifixed.

The ovary is superior, sessile, oval, with a terminal slightly bent style and blunt stigma. The fruit is an inflated legume with usually two seeds attached to the ventral suture. The seeds are beaked with wrinkled testa and are exalbuminous.

The seed is considered to be of high nutritive value and forms an important part of the Indian food. The flour prepared from this seed is very largely used in the preparation of various Indian sweets. It forms an excellent food for horses and cattle. The young tops of the plant are used as a potherb. The stem, leaves and husk are valued as an important cattle food especially for milch cows. The acid liquid collected over the plant is called vinegar and is used medicinally.

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