

Perennial or Tree Castor*

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Introduction. The familiar forms of castor, *Ricinus communis L.* are the cultivated varieties raised either dry or irrigated. Distinct from these there also exist certain perennial tree types of which little is known. Mention is made of the perennial variety in most of the literature on castor, but in no instance has an attempt been made to distinguish it from the other types or yet to describe it fully. Popova (3), the Russian worker, makes mention of a wild type of castor growing in India and elsewhere but does not say whether it is a perennial type. Hil'tebrandt(2) recognises the perennial form but does not describe it. Bahl(1) has it that in tropical countries the castor plant reaches the dimensions of a small tree and may attain a height of 20' to 30' or more, with a stout trunk and branches. In cooler countries, he adds, it becomes a shrub or bush 8' to 12' high and in localities where frosts occur it is a herbaceous perennial. There are numerous other references also which go to show, that, though the existence of a distinct variety perennial in habit and growing into a tree has been known, no detailed study has so far been made of this variety.

In this paper an attempt has been made to describe in detail the perennial types collected from various parts of the Madras Presidency and indicate the similarities and differences between the cultivated and perennial varieties of castor. The agricultural utility of the tree form has also been discussed as it is felt that some of the economic forms may with advantage be brought under cultivation.

Occurrence. In Madras Presidency the perennial castor is found to occur in almost all districts irrespective of altitude or climatic variation. But it is seen to thrive best on the hills viz. Nilgiris, Kodaikanals, Shevroys and Anamalais, between the two altitudes of 3,000 feet and 6,000 feet above sea level. Below 3,000 feet and on the plains, though it survives, its natural spread is very limited. Above 6,000 feet, again, it is met with occasionally mostly in non-frosty areas and sheltered corners not exposed to high winds. Thus, on the Nilgiris, this variety is seen in a wild form growing luxuriantly between Burliar (3,000 feet) and Coonoor (up to 6,000

* Contribution No. 16 of the Oil Seeds Section of the Madras Department of Agriculture.

Paper read on 8th November 1940 before the Association of Economic Biologists, Coimbatore.

feet). At Ootacamund and higher up it is seen in very restricted numbers. Lower to Burliar, at Kallar and below, this type is again seen only in patches. In the plains it is met with in most of the districts but only to a very limited extent.

Description of the perennial type. The perennial castor is a small tree growing to a height of eight to fifteen feet. The spread of the top varies from ten to twenty feet. The stem is thick and woody, and in a grown up tree about ten to twenty inches in circumference. The bark of the stem is conspicuous in older trees. Branching is continuous and multiple, the number of sympodiums met with increasing in relation to the age of the tree. The primary branches are also woody the thickest of them being nearly twelve to fifteen inches in circumference. In other morphological characters such as stem colour, nature of inflorescence, shape and size of leaf, nature of capsules, size and shape of beans, etc. the perennials are polymorphic like the ordinary cultivated forms.

The seed characteristics being the most important economically, variations observed in seed size, the number of beans per pound, and the oil and free fatty acid contents of the seed in some of the distinct types of perennial castor collected from different parts of the Presidency are given below :

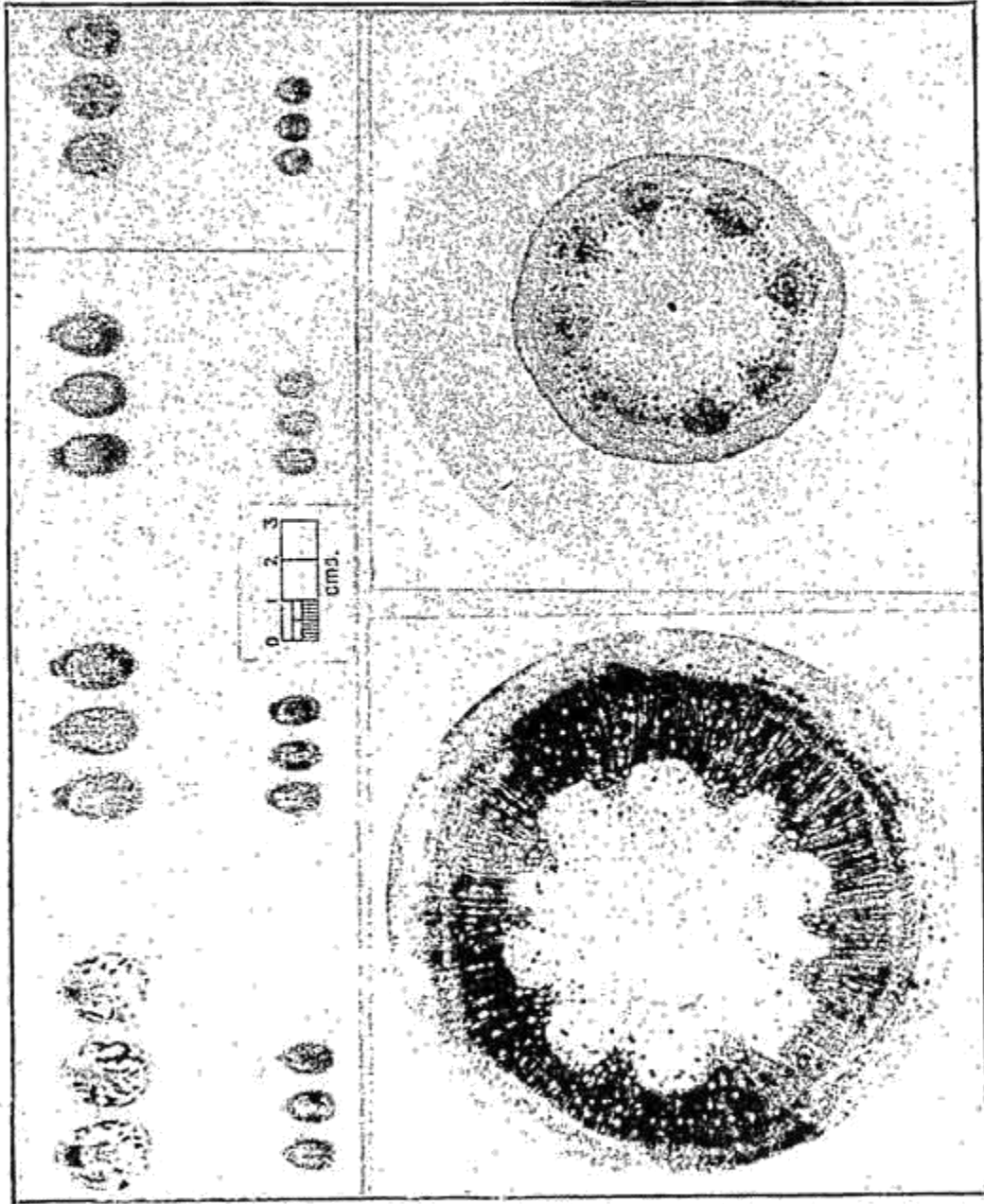
Variation in the size, oil and free fatty acid content of seeds of perennial castor.

Place of collection.	Seed measurements.			Number of beans per pound.	Oil content.	Free fatty acid content.
	Length.	Breadth.	Thickness.			
	Cms.	Cms.	Cms.		%	%
Anamalais No. 1	1.85	1.44	0.80	448	56.33	0.35
Gudalur Big-sized	1.74	1.01	0.69	688	51.22	0.36
Nanjanad	1.49	0.86	0.69	1,072	49.99	0.76
Anamalais No. 2	1.27	0.96	0.63	1,152	49.59	0.62
Cuddapah	1.18	0.94	0.64	1,243	44.87	1.24
Gudalur Small-sized	1.02	0.70	0.50	2,448	48.88	0.57
Coonoor	1.15	0.68	0.47	2,656	49.69	0.79
Anamalais No. 3	1.09	0.63	0.48	2,784	49.24	0.62
South Arcot No. 2	0.98	0.61	0.46	3,232	46.77	0.52
South Kanara	0.93	0.61	0.44	3,456	44.49	1.27
Malabar No. 2	0.95	0.57	0.45	3,552	47.42	1.10
Ootacamund	0.83	0.62	0.40	4,192	43.16	1.33
Malabar No. 1	0.86	0.58	0.43	4,864	44.10	0.84
South Arcot No. 1	0.91	0.54	0.41	5,376	45.00	0.78

The following observations based on the data obtained for different seeds are of interest:—

(i) The seeds of the perennial varieties vary considerably in size (figure 1) and are generally classed as big, medium or small. The number of beans (shelled seeds) per pound in the different varieties varies widely depending upon the seed size and ranges from as low a figure as 448 to as many as 5,376.

PERENNIAL CASTOR



2

3

1. Seeds of perennial castor types.
2. Cross-section of seedling stem of perennial castor; 1½ months old—× 10.
3. Cross-section of seedling stem of annual castor; 1½ months old—× 10.

(ii) The oil content varies from 43 to 56 per cent. Though it is a common belief that smaller seeds contain more oil than the bigger seeds, in all the varieties examined the reverse seems to be the case.

The yield of seed from the different varieties showed a range from as low a figure as half a pound to four pounds per tree. "Anamalais No. 1", "Gudalur Big-sized" and "Nanjanad" appear to be the best yielding among the types collected so far. Their oil content is also high (50% and more). In any initial selection of perennial types for bringing under cultivation, these three would prove suitable material.

The most immediate and striking difference between the cultivated and perennial castor is the presence in the tree type of a large woody main stem and the multiple and continuous branching of the tree. Though the cultivated varieties under irrigation or more favourable conditions may reach appreciable dimensions in height and girth, these two characteristics are never found in them. The tree castor once it has come to fruit will always be found to be a bearing tree while in the cultivated types the fruiting is seasonal. The perennial type commonly lives up to ten years and more.

The anatomy of the stem of the tree type differs from that of the cultivated varieties. The latter have the characteristic herbaceous stem with limited secondary growth while the stem of the perennial is typically woody, secondary growth persisting as long as the tree lives. A seedling stem (figure 2) of the perennial castor has a more or less continuous cylinder of primary xylem ensheathed by an unbroken cylinder of secondary xylem which is added to, indefinitely. In the young stem of the same age (figure 3) of the cultivated castor the vascular tissues are arranged in the form of discrete bundles in a cylinder. The stem of the cultivated type develops to a determinate girth when further growth ceases.

Apart from these differences which make distinction between the two forms fairly easy, in all other respects they resemble one another. The $2n$ and n number of chromosomes of the perennial types collected so far have been found to be 20 and 10 respectively which are the same as those recorded for cultivated varieties.

Agricultural importance of perennial castor. Since the perennial type of castor grows into a tree, it is very unlikely that it will be cultivated in arable land devoted to the annual crops. There are, however, other situations, where it could be raised with profit. Coffee and tea estates offer opportunities for exploiting the land further without hindrance to the main crop. Tree castor makes a good shade plant and by its perennial nature demands little diversion of attention from the requirements of the main commodity of the estate. The castor trees will yield annually substantial quantities of an oil seed which fetches a uniformly attractive price in the market. Apart, however, from coffee and tea estates, on the hills, waste lands by the side of rail or motor roads, fringes of forests, and other land

which is lying fallow due to one reason or other may be sown to the perennial type of castor with a view to get some income from otherwise unproductive land. In the plains, the tree castor is met with at present here and there in backyards, being grown for the seeds which yield oil of medicinal value. Its cultivation could be extended by utilisation of lands which are unfit for more productive purpose. Perennial castor has an extensive much branched root system. This feature makes it suitable for growing in areas subjected to soil erosion. Another use of the crop is its utility in providing fodder for cattle in places where fodder scarcity is frequent and grazing facilities are few. Lastly, where eri-silk worm rearing is established as a cottage industry, the perennial form offers a continuous supply of leaf and eliminates the necessity for growing fresh crops every year for this purpose.

Considered from the economic point of view, there are thrifty and unthrifty types of castor trees and it is only the former which should be raised for a money crop. The yielding capacity of the different types varies considerably as also that of individual trees in a type. Some trees branch more profusely than others but may have fewer capsules on each fruit cluster. A type with good branching, long and densely set fruit clusters, non-shattering capsules and with an oil percentage of more than 50 may be considered an economic variety.

In relation to the raising of castor trees in coffee and tea estates the following points merit consideration and attention must be devoted to them: (1) whether the castor trees will provide enough or excessive shade to the coffee or tea plant (2) whether the seed borer pest of castor (*Dichocrocis punctiferalis*) is also a pest on coffee or will it become so when the two crops are grown in close proximity to each other (3) if any of the other diseases of castor such as the leaf spot (*Cercospora ricini*) would find a new host in coffee or tea.

Cultivation of the perennial type is substantially that adopted for the annual excepting that the seed would have to be dibbled *in situ* with the necessary spacing required for any particular form. Sowing should be confined to the rainy season taking care to see that no prolonged drought or excessive rains are anticipated in the seedling stage of the crop. Preliminary trials conducted on the Nilgiris have shown that sowing during April with early rains is the best. The trees begin yielding in the first year and will continue to bear until the death of the plant.

Pests and diseases. Pests and diseases are comparatively few on this tree at higher elevations. However, mention may be made of the following which have been seen to a limited extent: the seed, capsule, and stem borer (*Dichocrocis punctiferalis*), the castor mite (*Paratetranychus sp.*) and the leaf spot (*Cercospora ricini*). In a recent trial of cultivated and perennial types of castor on the Potato Farm, Nanjanad, Nilgiris, the early blight disease of potatoes (*Bacillus solanaceorum*) was found to affect the young castor plants though nowhere has this disease been seen on the castor trees growing wild.

Summary. Though mention is made of a wild type of castor perennial in habit in most of the literature on castor, no effort hitherto has been made to study it.

The perennial form of castor is seen widely distributed in Madras Presidency, but it thrives best between the two elevations of 3,000 and 6,000 feet above sea level.

The perennial variety of castor is polymorphic and its description conforms to that of *Ricinus communis* L. in general. But it grows into a tree, has a thick woody stem and reaches a height of 8 to 15 feet. Branching in this type is continuous and multiple. The anatomy of its seedling stem differs from that of the cultivated variety. While in the perennial the vascular tissue forms an unbroken cylinder, vascular bundles of the annual types are broken and discrete in number. Secondary growth of the stem is early and pronounced in the tree castor and continues so long as the tree lives. In the cultivated types, on the other hand, with fruit set, secondary growth ceases confining the stem to determinate growth. The $2n$ and n number of chromosomes of the perennial forms are 20 and 10—the same as those obtained for cultivated types.

There are agriculturally useful forms of perennial castor which are suitable for bringing under cultivation. Those with good branching, long and densely set fruit clusters, non-shattering capsules and with an oil percentage of more than 50 are economic. The possible places for cultivation are coffee and tea estates, waste lands, rail and motor road sides and fringes of forests. The factors to be taken into consideration in such cultivation are given.

The perennial castor with its extensive and much branched root system aids in preventing soil erosion. It is useful as a fodder tree. It provides a continuous supply of leaf for eri silk worm rearing and eliminates the necessity for growing fresh crops every year.

Literature.

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