C A S T O R

Botanical name **:** *Ricinus communis* L.
Family **:** Euphorbiaceae
Origin **:** According to available literature, castor is indigenous to Eastern Africa and most probably originated in Ethiopia. It is also possible that castor is originated in the tropical belt of both India and Africa. In India, castor is known from very early days and is referred to in Sanskrit literature.

Castor plant belongs to Euphorbiaceae family. A large number of cultivars or types exist under *Ricinus communis.*Papova (1926) divided the species into 6 sub-species on ecogeographical grouping.

1) *Ricinus communis var. africanus*
2) *Ricinus communis var.chinenesis*
3) *Ricinus communis var.maxicanus*
4) *Ricinus communis var.pericus*
5) *Ricinus communis var.sanguineus*
6) *Ricinus communis var.zanzibarinus*

Castor belongs to the genus Ricinus, a member of the Euphorbiaceae, which contains a vast number of plants mostly native to the tropics. The genus Ricinus is considered to be monotypic and R. communis is the only species, which includes many polymorphic types. The cultivated types are dwarf annuals. Castor plants have well-developed root system with thick horizontal roots. Tap root looks like extension of the stem below the soil. The stem is erect, circular in section, partially hollow, glabrous, and smooth with good branching. Stem is either red or green or with shades of both. The stem is marked by well-defined nodes from each of which a leaf is arises. The lower internodes are shorter and their length increases with height. Leaves are alternate, large, and palmate with 5-11 lobes acuminate margins notched, serrate or indented. They are carried on long stout petioles. The inflorescence is borne terminally on the main and lateral branches. Flowers are large, in terminal sub panicled racemes, monoecious, apetalous, the upper portion of the raceme being occupied by the female flowers and the lower by male flowers The whole inflorescence may reach a length of 90 cm. The flowers are wind and insect pollinated and from 5 to 46 % natural pollination occurred. The fruit is round glaucous capsules with three projecting sides covered with tough spines or smooth, 3 loculed and three seeded. Seeds are albuminous, anatropous, broad, oval, compressed with a marked caruncle and longitudinal raphe. The testa is thin, brittle, varying in colour and mottling. Below the testa is thin legmen, covering a whitish oily endosperm containing the embryo.

Area and distribution

Castor is grown under varied climatic conditions viz., tropical, sub tropical and temperate. However, its cultivation is largely confined to the countries lying between 52' N to 40' S latitude. The major countries growing castor are India, China, Brazil, USSR and Thailand.

India ranks first in the world in respect of acreage (5.4 lakh hectares) and production (2.6 lakh tonnes) in the world. It contributes about 28 % of the world's acreage and 36 % of total output. Following Brazil, India occupies the next prestigious market position in the world's castor market and each year exports substantial part of its total produce to earn foreign exchange. The major castor growing states in the country are Gujarat, Andhra Pradesh, Tamil Nadu, Orissa and Rajasthan. It is also grown in the states of Uttar Pradesh, Mahrashtra, Karnataka, Madhya Pradesh, and Bihar.

The Gujarat state ranks first position in the country with respect to area and production and productivity among all major castor growing states in the country because majority of farmers are adopting hybrid varieties and cultivating this crop as irrigated crop (In river belt and dry farming areas, it is taken as rainfed crop). In Gujarat, it is grown in an area of about 3.5 lakh hectares with an annual production of about 6.8 lakh tonnes of castor seeds. The most important castor growing districts in Gujarat are Mehsana, Sabarkantha, Banaskantha, Kutch, Ahmedabad, Kheda, Vadodara, Rajkor, Jamnagar and Gandhinagar. In other districts except Valsad, Dangs and Navsari districts, it is cultivated in more or less area. Gujarat developed the hybrid variety first in the world.

Economic importance

Castor is an important industrial non-edible oilseed crop. Castor seed contain **45-47** % non-edible oil, which is used as domestic, medicinal and industrial purposes. Castor oil is used as a lubricant in all moving parts of the machinery and particularly high speed engines and aero planes. Hydrogenated castor oil is used in polishes, varnishes, transparent paper, linoleum, plasticizers, ointments, waxes, printing ink, cosmetics, hairdressing, soaps etc. In dyeing industries and disinfectants, it is used for the preparation of Turkey red". Castor oil is also used as purgative. It is used in many veterinary uses. It is also used for medicinal and lighting purposes. It is use externally as an emollient and also used as soothing medium when dropped into the eyes of animals after removal of foreign bodies. Oil received from small seeded variety is of very good quality and specially used as a medicine, while oil received from bold seeded variety is used for lightening and lubrication etc.

Because of its deep root system, drought hardiness and quick growth, it finds a place of prestige in the cropping systems of dryland agriculture in semi-arid zones of India. The castor cake is valuable manure for field crops but due to the presence of poison "Ricin", it is not feed to the cattle. It is useful as a trap crop because root contain "ricin" (poisonous alkaloids) which kills nematodes entered into roots. It is used as windbreak crop for

sugarcane, papaya and banana crops. In eri silk-producing areas, leaves are fed to eri worms. The plant stalks are used for fuel purpose or as that ching material or for preparing paper pulp.

Castor plant is also grown on the border of the nursery for natural insect control. The prodenia (leaf eating cater pillar) may lay the eggs on the lower side of the leaves of the castor, which can be destroyed by picking the leaves, and buried into the soil. This crop is also helpful as a trap crop as roots of plants trap the nematods.

Dry leaves of castor contain 24 % crude protein along with "ricin alkaloid which is poisonous but green mature leaves can be fed to the cattle with proper care i.e after washing them into the water.

Castor seed and castor cake are highly poisonous to man and animal because it contains a toxic alkaloid ricinine and ricin. But the castor cake is a good source of organic manure as it contains nitrogen 4.5 %, P_2O_5 1.75 % and K_2O 1.5 % and also control white ants and nematodes.

Climatic requirement

Castor requires a moderately high temperature 20 to 27 ˚C with low humidity throughout the growing season. It grows best in areas where there are clear warm sunny days. Prolonged cloudy weather with high temperature at the time of flowering resulted in poor seed setting, which is known as sex reversion.

High temperature above 41 ºC at flowering time even for as short period results in blasting of flowers.

The plant is considered to be very resistant to drought but even than about 80-100 mm evenly distributed rainfall is required for optimum growth. Heavy rainfall at flowering reduces the yield. Castor plant is very susceptible to frost but some annual cutivars can grew even an altitudes of 1200 to 2100 m, e.g. Nilgiris, if sown in March- April, perennial varieties are grown at still higher altitude for shade in coffee estates.

Soil

Castor can be successfully grown on any type of soils except clays as the castor crop is highly susceptible to water logged conditions. It is generally grown on red loam soils in peninsular Indian and on light alluvial soils in northern states. Inferior soils not fit for valuable commercial and food crops are often used for raising castor crop. The crop cannot tolerate alkalinity of soil but withstand slight to moderate acidity of soil. Its cultivation should however be confined to upland areas as this crop is highly susceptible to water logged conditions.

Field preparation

Castor being a deep-rooted crop requires well-prepared seedbed (deep rooting medium). Deep ploughing in summer is necessary to break up any compact layer in the soil so that roots can penetrate deep in the soil to obtain moisture from deep layer of the soil during dry periods. Deep ploughing will also increase water-holding capacity of the soil. Disc harrowing should be done followed by ploughing to break clods, level the seedbed and destroy weeds. The seedbed should be moist to a depth of 15-20 cm.

Sowing time

1. For rainfed crop - onset of the monsoon i.e 15th June. Sowing after 20 July gives poor yield in kharif crop.
2. For irrigated crop - 1st July to 15th August

In early sown (i.e. 15th June) crop, the infestation of semi-looper is observed so that appropriate control measures should be taken. It is grown early to take the advantages of the rainfall.

Seed rate

1. For irrigated - 5 to 6 kg/ha - by dibbling method
2. For rainfed crop - 10 to 12 kg/ha

Seed treatment

Seeds should be treated with 1g Bavistin or 3 g Thiram/kg of seeds for controlling seed and soil borne diseases.

Spacing

In poor soil - 90 cm x 60 cm under rainfed and 90 cm x 20 cm under irrigated conditions (North Gujarat) and in fertile soil - 120 x 60 cm (Middle Gujarat). The seeds may be sown at a 8 cm depth behind the plough or maize planter.

Manures and fertilizers

Manures : Well powdered FYM or compost @ 25 cart loads/ha

Fertilizers

For rainfed crop

N kg/ha	P_2O_5 kg/ha	K_2O kg/ha	Stage of application
20	40	0	As basal application
20	0	0	At flowering stage i.e. 45 DAS
40	40	0	Total

For irrigated crop

N kg/ha	P_2O_5 kg/ha	K_2O kg/ha	Stage of application

37.5	50	0	As basal application
37.5	0	0	At flowering stage i.e. 45 DAS
75	50	0	Total

Green manure increase yield and save 60% N in north Gujarat conditions.

The castor GCH-5 growing farmers of north Gujarat are advised to apply 120 kg N/ha in three equal splits i.e. at sowing, 40 DAS and 100 DAS. For castor seed production in north Gujarat, female line should be fertilized with 125kg N/ha.

Farmers of north-west agro-climatic zone growing castor GAUCH-1 are advised to apply 30 kg N + 20 kg P_2O_5/ha, of which N should be applied in two equal splits, half at 45-50 days after sowing the crop.

Irrigation

Castor is mostly raised under rained conditions. However, it has been observed that it responds very well to irrigation. Castor being a deep-rooted crop can extract water from considerable depth in the soil. Irrigations may thus be relatively heavy and less frequent. For higher yields, wherever, possible 2-3 heavy irrigations may be given. In case of soil moisture deficiency at flowering stage, essentially one irrigation be provided. In heavy rainfall areas, proper drainage is most essential.

Under irrigated conditions, 3-4 irrigations at an interval of 15 to 20 days should be given after cessation of monsoon

Farmers of south Saurashtra zone growing GCH-4 are advised to apply 11 irrigations to their crop. After cessation of monsoon, three irrigations should be given at 20 days interval and remaining 8 irrigations at 15 days interval. Mulching with straw mulch @ 5 t/ha can result in 10 % more income, though black plastic mulch (BPM) can increase the yields by 22 %, it is economically not viable at present.

For castor seed production in north Gujarat, 14 irrigations each of 60 mm depth to female line are recommended. The interval between two irrigations should be 10 days during October and November and 15 days during December and February. The female line should be fertilized with 125kg N/ha.

Weeding and interculturing

Conditions during kharif season are conducive to rapid and luxurious growth of weeds. Weeds compete with the plants in the early stage of growth. Weed competition period is found between 15 to 45 Days. To control the weeds, 2 hand weeding, one at 30

days of crop growth and the other after 60 days of crop growth should be given. Eptam @ 3-4 kg a.i./ha incorporated in the soil 3 weeks prior to planting gives good control of annual grasses and broad-leaved weeds. Three to four interculturing should be carried out before flowering stage.

Farmers of south Saurashtra growing hybrid castor – 4 are advised to apply fluchloralin or pendimethalin 0.9 kg/ha as pre-emergence blanket application along with HW and IC at 30 DAS.

(A) Crop Rotation

1 Castor – Wheat/ Mustard/ Onion

1) Castor – Peralmillet - Groundnut/ Guar

(B) Crop sequences

a. Castor – Groundnut (S).
b. Castor – Sorghum (F)
c. Castor – Vegetables (S)
d. Castor – Peralmillet (S)

(C) Intercropping: It has been followed in dry farming areas.

i) Castor + Sun flower (1 : 2)
j) Castor + Soybean (1 : 1)
k) Castor + Cluster bean (2 : 1)
l) Peralmillet – Groundnut bunch (1 : 3)

Plant protection measures

Pests : Semi looper, Capsule borer, Jassids, thrips and whiteflies

Diseases : Bacterial leaf spot, Wilt

Nipping of axillary buds

If all axillary buds on the main shoot are nipped soon after emergence of the primary spike and thus a single main spike is allowed to develop, not only the duration of the crop is reduced but also yields are increased substantially (This practices are followed for local varieties only.

Harvesting

It takes 145-180 days to mature. Harvesting is done when capsules turn yellowish. However, all the capsules do not mature at the same time. The central spike on the main

rachies mature first and thereafter the spikes on the side branches start maturing. Therefore, generally two to three pickings may be needed for harvesting the entire crop. The spikes should be dried in the sun light for four to five days and then threshed by beating the dried capsules with wooden sticks or trampling under the bullock feet or with the help of electrical thresher. The main spike is ready for harvest at 90 to 100 days and remaining spikes should be harvested at an interval of 15 days according to their maturity. Shattering should be eliminated. Harvesting of pre-maturing spikes lead to poor yield and ultimately oil yield with poor quality. Harvested capsules should allow drying under sun light for 5 to 6 days before threshing.

Yield : 1000 to 1200 kg/ha (Rainfed crop)
2000 to 3000 kg/ha (Irrigated crop)

Research Station : AICRP on Castor,- Sardar Krushinagar
Sub Centre at Vijapur

Varieties

Variety	Main spike maturity	Maturity	Bloom	Stem colour	Year of release	Parents		Developed at	Av. Yield (q/ha)	Oil (%)
						Female	Male			
1	2	3	4	5	6	7	8	9	10	11
GCH-3	95-100	150	Double	Pinkish	1970	TSP 10-R	J-1	JND	13	45.7
GAUCH-1	95—115	200	Triple	Greenish	1973	VP-1	VP-9	Vijapur	16	46.2
GCH-2	100-120	200	Triple	Greenish	1984	VP-1	JL-35	SKN	18	47.8
GCH-4	-	200	Triple	-	1986	VP-1	48-1	SKN	20	Wilt resistant and non-shattering habit
GCH-5	-	-	-	-	1998	-	-	SKN	-	-
GCH-6	-	-	-	-	2001	-	-	SKN	-	Resistant to root rot, tolerant to wilt

										and early maturing
GCH-7	-	-	-	-	2006			SKN		

The bloom or waxy coating found on the stem and certain parts of the castor plants is a natural protection to the plants both from pests and diseases and drought.