



Karonda Fruit Crop for Under Dry Land Condition

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Introduction:

Karonda (*Carissa carandas*) belongs to Apocynaceae family. It produces berry-sized fruits that are commonly used as a condiment or additive to pickles and spices. It is a very hardy, drought-tolerant plant that thrives well in a wide range of soils. Karonda is an evergreen shrub or short stature tree. It grows naturally in the Himalayas and Western Ghats at elevations of 300 to 1800 meters. It is found grown in wild in India, Malaysia, South Africa. In India, it grows in Bihar, West Bengal, Maharashtra, Karnataka and other states. It is cultivated in Rajasthan, Gujarat, Uttar Pradesh states of India. It is a well suited to arid climate and grown well at higher temperature. It is commonly uses for making ledge for orchards. Karonda fruit is a rich source of iron and contains a fair amount of Vitamin C. Mature fruit contains high amount of pectin. The fruits are used for pickle making. It is also used for Jam, Jelly, Squash, Syrup, Chatney etc.

There are good demand Karonda products in market. There are more than 25 species in genus *Carrissa*. Out of these, 5 species are indigenous to India.

Plant and Flowers of Karonda

Karonda is a medium sized, thorny shrub. It has a greenish white bark on young shoots and greyish brown on mature stems. The spines are straight and 1-3 cm long. At times, these are also forked. Its leaves are opposite, generally 2-3 cm x 1-1.5 cm, and ovate. They are green with shine above and a dull green shade below. Old leaves keep shedding throughout the year. New buds also keep sprouting through the year, though more during spring. Karonda flowers from February to June. The flower of these are white, scented and produced in clusters of 2 to 5 flowers. The corymbose cymes appear at the ends of twigs. The fruit is a globose berry. It appears from March to August and ripens between May and December. Immature fruits are green in colour and turn to white to reddish purple at maturity.

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These are round to oblong, sweet, though slightly acidic, juice when fully ripe. Karonda wood is hard, straight-grained and use for firewood purpose. The green plant serves as a protective hedge around agricultural holdings.

multi-colored appearance. When young, the fruits are green to white, transitioning into a bright red-pink hue, finally ripening into a dark purple, almost black shade with maturity. The thin but tough skin will also change from taut, smooth, and glossy to slightly wrinkled



Plant and Flowers of Karonda

Nutrients	Nutritional value (100 gram)	
	Fresh	Dry
Energy (Calorie)	42	364
Moisture (%)	91	18.2
Protein (%)	1.1	2.3
Carbohydrate (%)	2.9	67.1
Fat (%)	2.9	9.6
Mineral (%)	-	2.8
Calcium (mg)	2.1	160
Phosphorus (mg)	28	60
Iron (mg)	-	39
Vitamin –C (mg)	200-500	1

Fruit description:

Karonda fruits are small berries, averaging 1 to 3 centimeters in length, and have an oval to ovoid shape with curved ends. The berries grow in clusters of 3 to 10 fruits and ripen at different stages, giving the shrub a

with some give when ripe. Underneath the surface, the flesh ranges from pale red to crimson, depending on the degree of ripeness, and is aqueous and soft, encasing 2 to 8 flat, brown seeds. When harvested, the fruits may also emit a milky white latex that should be

removed before eating. Fruits are sour and astringent in taste, and are a rich source of iron and vitamin C.

Karonda has good nutrition value. It is rich in Iron, The fruits also contains vitamin C and It is antiscorbutic and very useful for cure of anaemia. Karonda fruits are used in many ayurvedic formulations and us to their nutritional values. The extract of root is used for Chest pain. The extract of leaves is used for fever. The study conducted at Indian Horticultural Research Institute, Bangalore revealed that the fruit are rich in Thiamine (B1),Riboflavin (B2),Pantothenic acid (B5),Pyridoxine (B6),Biotin (B7),Folic acid (B9).

Climate:

Karonda is a handy fruit. It can be grown successfully is tropical and subtropical climate plant growth is affected in high rain fall and waterlogged areas. High temperature and arid climate is suitable for karonda cultivation. Temperature climate with high frost and snowfall areas are not suitable for this fruit. As the plants are sensitive for low temperature and front injury. The water logged areas of tropical and subtropical regions are not suitable for it cultivation.

Soil:

Karonda is grown successfully on a wide range of soil types, viz. sandy loams, laterite, alluvial sand, and calcareous soil even

it is found growing well in stony , rocky and less fertile soils. but the better growth and higher yield is obtained in alluvial sandy loam soils with good drainage. The performance of orchards is very poor on clay soil with poor drainage. The can be grown in wide ranges of soil pH ranging from 5.0to 8.0.

Varieties:

The Karonda cultivars may be categories as per their colour of fruits viz., pink-white, greenish pink and reddish purple or on the basis of utilization. The fruits of pink varieties are white in colour at stage and turn to pink at maturity. The colour of reddish , purple varieties are green at immature stage and turn to Reddish purple at maturity. The karonda varieties may be also classified in two categories i.e. pickle type varieties and table purpose varieties. Some varieties of Karonda varieties have been developed during last two decades . Pant Manohar, Pant Sudarshan, Pant Suvarna are pickle type varieties develop at GB Pant university of agriculture and technology. The varieties have smaller fruits (3.5 g weight) and acidic in taste while Konkan bold, CHES K-II-7 and CHESK-35 are bold size and suitable table purpose.

Pant manohar

This variety is developed from GB PUA&T Pantnagar (Uttarakhand) in 2007. The plants of this varieties are medium– sized dense bushes ,fruits are dark pink blush on

white background, weighing 3.49g. seeds 3.94 / fruit, flesh 88.27%, dry weight 12.77%, TSS 3.92%, total titrable acidity 1.82% and yield 27 kg / plant.

Pant Sudarshan

This variety is developed from GB PUA&T Pantnagar (Uttarakhand) in 2007. The plants of this varieties are medium-sized dense bushes. Fruits are pink blush on white background. On ripening fruits become dark brown. Average fruit weigh 3.46 g, seeds 4.68 / fruit, flesh 88.47%, dry weight 11.83%, TSS 3.45%. total titrable acidity 1.89% and yield 29 kg / plant.

Pant Suvarna

This variety is developed from GB PUA&T Pantnagar (Uttarakhand) in 2007. Plants are upright growing and sparse. Fruits are colour dark brown blush on green background. Average fruit weight 3.62 g, seeds 5.89 /fruit, flesh 88.27%, dry weight 12.39%, TSS 3.836, total titrable acidity 2.30% and yield 22 kg / plant. On ripening, fruit colour changes to dark brown.

Konkan bold

This variety is developed from Konkan Krishi Vidya Peeth, Dapoli (Maharashtra) in 2004. The plants are medium in size and vigorous. It flower in the month of Feb.-March and fruit ripe in the month of May-June under Coorg conditions. Fruits are oblong in shape and 12-154g in weight. The colour of

fruits is dark purple. The fruits are sweet with 10-12 ° Brix Total soluble solid. The tree are prolific bearing and produced 2000-2500 fruit per year. This variety is suitable for table purpose.

CHES- K- V-6

This is promising line indentified from the seedling population at CHES Chettalli. The plants are medium size and it flowers in the month of January-February and fruits in May-June. The average fruit weight around 13-15 g, dark blackish redin colour with red pulp and very less seeds. The Total soluble solids of fruit is around 16 ° Brix with 1.18percent acidity and 21 mg vitamin-C/100g pulp. A four year old tree yield 1200-1500 fruits per year. Fruit are also rich in Vitamin -B. This variety is suitable for table purpose.

CHES- K-II-7

This is promising line indentified from the seedling population at CHES Chettalli. The plants are medium size and flower in the month of Feb.-March and fruit ripe in the month of May-June. Fruits are oblong in shape and 12 -13 g in weight. The colour of fruits is dark blackish violet in colour and Thin fruit skin. The fruits are seedless (0.3 seeds/fruit) A four year old trees yield around 1800-2100 fruits per plants per year. Fruits are sweet with TSS 15° Brix and acidity - 1.08%. This is suitable for table purpose and processing.



CHES- K- V- 6



CHES- K-II-7

Propagation

Karonda is propagated through seed propagation and vegetable propagation methods such as cutting, layering and budding.

Seed Propagation

Karonda plants can be multiplied through seed very easily. Seed propagation is mostly commonly used methods in Karonda. The seed should be collected immediately after harvesting. The seeds sown immediately after extraction give higher germinated. Seeds are shown in trays and these seedlings are transplanted in poly ethylene bags at 3-4 leaf stage. The plants because ready for planting in

8-10 months. The germination in seedless or less seeded varieties is low. The plants produced from seeds have lot of variability with respect to fruit size, colour, taste etc. Thus it is not preferred for multiplication of varieties and elite lines.

Vegetative propagation:

Stem cutting, air layering and budding are used for multiplication of varieties / elites lines to produce true type planting material.

Cuttings:

The semi hard wood cuttings are suitable for multiplication of plants. Generally, 25-30 cm long and 1 diameter cuttings may be used for propagating plants. The best time for planting cutting is June –July. The trial conducted at CHES, Chettalli found that success was higher in semi hard wood cutting than softwood, semi hard wood and hard wood cuttings. The treatment of IBA failed to enhance the success in both hardwood and soft wood cutting.

Air layering:

The air layering of Karonda plants was found successful well performing during June –July. The success rate was variable from 30-60% in different years. The air layers were removed the plants in the month of September

and planting in polythene bags and they become ready for planting after 6-7 months.

Planting:

The soil should be leveled before planting and all the old plants need to be removed. These pits filled with FYM and soil mixture to one by one different time of planting of these June-July. The table purpose variety of Karonda should be planted at 3X3 meter distances in square. The method of planting the pits of 3X3 ft. size should be prepared at least one month before planting. These pits should be filled with equal amount of FYM and soil mixture. The proposed time of planting of this is June-July. The land should be cleaned and leveled with a mild slope in the opposite direction of the water source. The hedge plating of karonda is done at 2 fit distances. The hedge planting trench of 1X 1 feet size is done. The pits of 1x1 feet can be also made instead of trench. For planting of orchards, the planting is done at 3x 3 m distance with square system. The pits of 2x2 feet size should dug before rainy season.

Manure and Fertilizers:

Karonda plants grown as protective hedges require limited fertilization. Manuring however is beneficial. Its plants slowly get exhausted after taking 2 crops and show symptoms of die back. Therefore, 10-15 kg well rotten farmyards manure or compost/plant applied before flowering is useful (Chadha,

2003). Karonda plant life grown as defensive hedge are hardly ever manured or fertilized. Manuring, however, is beneficial. Otherwise, its plant life slowly gets exhausted after taking 2 year and begins displaying signs and symptoms of die back.

Training and Pruning:

Regular plantations of Karonda may be trained on single or double stem. Therefore, extra undesirable shoots or laterals are eliminated from time-to-time to present the plant preferred shape. Suckers springing up from diseased dried twigs must be eliminated.

Water Management:

Karonda is a hardy plant. The newly planted plants should be given irrigation. Young plants should be irrigated at 10-15 days interval in the winter and 6-7 days in summer season. The basin or flood method of irrigation is normally practiced. However, adoption of drip irrigation has been found to be effective in the economic use of water and enhanced growth. The adults orchards are generally not irrigated. Mulching with dry leaves or residues in the basin helps in moisture conservation.

Diseases and pests:

Anthracnose

The Karonda plants are affected by Anthracnose. The symptoms are developed in the leaves as Irregular size black, brown, lesions e. These spots increase and decreasing the size of the leaves. The disease also effects

fruits and branches. The diseases may be controlled by spraying of copper based fungicide copper oxide, copper trioxide in the initial stage. The orchards sanitation like burning of fallen leaves and fruits help to reduce inoculums.

Leaf eating caterpillars:

Caterpillars cause much damage, mainly by eating leaves. This affects the growth of the plants. Caterpillars may be controlled by through the use of pesticides, biological control and cultural practices. The chemicals, monocrotophos (2ml/l may be used for control of leaf eating caterpillars.

Fruit fly, *Bactrocera dorsalis*, *B. caryeaea*

Moderate infestation of fruit fly infestation was noticed on karonda. Fruit fly infests the ripened fruits. Its infestation is more in southern states. The female fruit fly lays eggs on the mature fruits with the help of its pointed ovipositor. After hatching the maggots feed on pulp of these fruits and the infested fruits starts rotting and fall down. As a result brown patch appears around the place of oviposition. The maggots come out of the affected fruit and pupate in the soil. Preharvest IPM combined with sanitation (Collection and destruction of fallen/infested fruits) + Placing Methyl eugenol trap @ 4-6/acre + In severe infestation spraying of bait spray (Decamethrin (Decis) 2ml+ 100g of jaggery in 1 litre of water) is recommended.

Harvesting and yield :

Karonda plant starts yielding after 3rd year. In Western Ghats flower starts in December to March and fruit mature in the month of April to June. The maturity of fruits is judged on the basis of change in colour. All fruits generally do not mature at one time therefore harvesting is generally done 3-4 times. Harvesting is done manually. The harvesting of fruits with stock helps to minimum the oozing of latex by fruits and enhances quality and storage of fruits. A plants may yields 4-5 kg fruits. The promising lines planted as orchard may yield 10-15 kg per tree. The fruits can be stored for 3-4 days under room temperature. The fruits used for making jam, candy and pickles.

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