

# *Forking Malady of Carrots and its Management*

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## **ABSTRACT**

Forking is a common malady found in carrots. The major reason for forking of carrots is the infection by root-knot nematodes. They are serious pests of most vegetable crops. These are very small, thin worms invisible to naked eye. They are found in soil in large numbers.

## **INTRODUCTION**

Carrots are very important source of Vitamin A, minerals and dietary fibre essential for health. Diseases related to shortage of blood and eyesight can be prevented by consuming the tap roots of carrot. Carrots are consumed raw as salad or cooked to prepare curry. The carrot pudding or Halwa is a popular healthy sweetmeat. Fresh carrot juice is a highly nourishing and refreshing beverage. The Kanjii prepared by fermenting red or purple carrots makes a tasty tangy drink, so refreshing in summers. Carrots can be preserved in various forms as pickles or dried chops or flakes or powder with high demands. Obviously, production of red, yellow or purple carrots is a

profitable farming for farmers. The traders and industry also require good quality carrots for profitable business.

The healthy carrots are 15-30 cm long tapering tap roots with average girth of 2-6 cm. They grow well in light textured soil with good water availability and drainage. Mostly farmers grow carrots in rotation or in mixed crops with other vegetables. Often they find that some of the carrots are deformed and forked into two or more branches that may be straight or misshapen. Often they are covered with many secondary roots. Such carrots are not accepted in the market (Stuab, 2010). Thus, the farmers suffer huge loss

of their labour, time and inputs. They suffer from loss of income.

### **The Forking Disease and its Cause**

The major reason for forking of carrots is the infection by root-knot nematodes. They are serious pests of most vegetable crops. These are very small, thin worms invisible to naked eye. They are found in soil in large numbers. They enter the new roots of plants and derive their food from the root tissues. They cause swelling of the nearby root tissues. Due to this the nutrients and water taken up by the root from soil does not reach the upper parts of the plant. This causes reduction in growth of and yield of plants. Shorter and yellowish plants are seen in patches in the field where the population density of these plant parasitic nematodes is more. These nematodes have a very wide host range and infect more than 3000 different kinds of plants. The crops such as tomato, brinjal, okra, amaranth, potato, beets, peppers, carrots, cucurbits like bottle-gourds, sponge-gourds, bitter-gourds, squash, ashgourds, water-melons, musk-melons etc., are all very good hosts of root-knot nematodes. The population density of these nematodes increases in soil over the years. When such crops are grown by farmers in the same fields in one or more seasons before or with carrots, these nematodes enter the young tap-root of carrot at the growing tip and stop its growth at that point. As a result, the plant produces another branch of the tap-root. The new tap-root may also be infected by the infective nematode juveniles, and that root (Rose, 2006) also gets branched. When several branches of tap root of the same plant are growing, they remain short and sometimes twisted. Thus, these carrots are consuming nutrients and water continuously, but do not produce good-looking straight tapering normal carrots.

### **Methods to Prevent damage due to nematodes**

The plant parasitic nematodes spend one or more stages of their life cycle in the soil. Once they enter the plant roots, there is no method available to cure them (Greene, 2012). Therefore, almost all methods to reduce the number of nematodes are required to be taken before the crop is sown in the field. The following methods are suggested for reducing the infection of carrot roots by root-knot nematodes that cause forking of carrots:

- 1) Do not grow carrots in a field in which vegetable crops grown in the previous season had small or big swellings or root-galls. Gently remove the fine roots of crops at the time of harvest, wash gently with water and observe the root with a magnifying lens to see the root-knot nematode galls.
- 2) Carrots can be grown in fields in which the previous crop was wheat, barley, oats, mustard, rice, sorghum, pearl millet, sesame, etc.
- 3) Practice deep summer ploughing of field to expose the soil to heat and desiccation.
- 4) Apply farm-yard manure enriched with bio-agents like *Trichoderma viride*, *Trichoderma harzianum* or *Pseudomonas fluorescens*.
- 5) If possible follow crop rotation in which the field is divided into two parts. Wheat/Barley/Oats/Sorghum/Bajra/Maize/Mustard/Sesame can be grown in one year in one part and vegetables in the other part in alternate years (Encyclopedia of Food and Health, 2015).

Farmers may identify the disease by observing the roots of crops in the previous crop and the disease appearing on carrots by methods explained above. They may follow the above

practices to reduce their loss and improve production of healthy carrots.

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