

# Checking Cashew Diseases and Growing Healthy Cashew:

## A REVIEW AND SUGGESTIONS

By

YATEENDRA JOSHI

Central Plantation Crops Research Institute, Regional Station, VITTAL 574 243

### Summary

Establishing a thrifty cashew plantation and maintaining the plants vigorous and productive is a matter of sound husbandry technique supplemented with a few crop protection measures. The more serious diseases of cashew, responsible for poor production at different growth phases of the plant, are outlined. These are then discussed against the background of the ecological requirements and growth habit of the cashew plant. Certain aspects of crop protection about which more information is required are indicated.

It has always been the lot of cashew to be planted on soils where virtually no other crop can be profitably grown. In India laterite hillocks of the West Coast and sandy stretches of the East Coast are commonly planted with cashew (Ramakrishnan, 1955). It does not receive much attention by way of cultural practices or manuring, either. And in north east Brazil, it is the self sown and semi natural plantations which are exploited (Agnoloni and Giuliani, 1977).

Nevertheless, stands of cashew thrive in such tracts though yields are poor. The average yield in India is only about 2 kg of nuts a year though hybrids yielding as much as 20 to 30 kg are reported (Bhaskara Rao, Nair and Nambiar, 1979). In a large measure this gap is owing to indifferent selection of seeds or other planting material and negligent management. Serious diseases affecting cashew are few but can cause considerable damage when these do occur (Small, 1922, Phillip, 1973).

So far, no virus has been reported to infect cashew.

In this review, the available information on serious cashew diseases is collated to evolve a set of guidelines for cashew

growing made up of husbandry practices to encourage thrifty growth backed by appropriate crop protection measures. It should be confessed however, that insect pests of cashew have been only marginally touched upon here. A more comprehensive crop protection schedule must take into account such pests.

The growth habit of cashew in the context of cashew diseases at each stage—from germination to fruit ripening—and the particular disease problem which beset it, are discussed along with suitable control measures in the following pages.

Though effective methods of vegetative propagation of cashew are available, it is yet impractical to use these for extensive planting. At present, new plantations will have to be set up from nursery-grown seedlings. The following discussion, therefore, considers the raising of nursery stock from seed only. The consensus of opinion at the International Cashew Symposium held in India in March 1979 was that isolated elite farms be set up to supply quality seed.

### Seedling Stage

At no other stage the cashew plant is so vulnerable as in this stage. First,

the prolonged period between sowing and seedling emergence, and the erratic germination, mean that protection measures must be intensive. Secondly, whereas at a later stage infection may only debilitate the plant, with seedlings it is often outright death or a drastic setback owing to severely reduced vigour. Thirdly, very young seedlings lack the thick protective layer of cork—a mechanical barrier to invasion by root infecting fungi—which develops later in perennial dicotyledons (Garrett, 1970).

The aim, therefore, is to steer the plant clear as quickly and safely as it were, of the several potential threats that lie in its way. Any practice that promotes quicker and more uniform germination of seed and helps in producing rapidly growing and vigorous seedlings will contribute to attaining this goal. These are briefly outlined below.

#### **Seed selection**

For best results use only such seeds that will sink in a 15 percent (W/V) sugar solution (Northwood, 1967).

#### **Seed treatment**

Soak the seeds for 2 hours in acetone, dry and re-soak in water for 24 hours more before sowing (Subbaiah, unpublished results).

#### **Sowing method**

Place the seed 2.5 cm deep in upright position with stalk as uppermost (Rao, Rao and Hassan, 1957).

Table I shows the more severe seedling disease reported so far. All the pathogens responsible for these diseases are seed borne.

Secondly, the diseases were particularly severe in rainy season or when soil drainage was poor. Lastly, pythiaceus fungi are well known to inflict sever injuries when the soil contains abundant moisture.

It is therefore suggested that well drained soil or potting mixture be used to raise cashew seedlings. If found necessary, fenaminosulf ('Dexon') for pythiaceus fungi and broad spectrum fungicides such as carbendazim or captan may be used. Olunloyo (1976) recommended 114 kg of 'Dexon'/ha of soil but this was derived from actual application of 50 mg/kg of soil. Seed treatment has hardly been given any attention but it will be worthwhile to find out an efficacious seed treatment chemical and the best method of its application which should go a long way in ensuring disease-free seedlings.

Details of deficiency symptoms in cashew seedlings are given by Ohler and Coester (1979) and any such deficiency, if observed, should be made up by appropriate measures.

For unimpeded growth of the root system, a minimum size for the containers is recommended (Agnoloni and Guiliani 1977). The container should never be less than 15cm in diameter and 25 to 30cm in height.

The ability of cashew to withstand drought depends on the extent to which it faces competition for water and nutrients from adjoining plants (Argles, 1977). Thus though the recommended spacing is between 7 and 9 m, it needs modification based on soil fertility and availability of moisture in dry seasons, lest its vigour be affected by water stress.

#### **Vegetative Growth**

The cashew is a spreading, evergreen tree and grows under average conditions 5 to 6m tall with a large canopy spreading over a radius of 3 to 4m. It branches freely. Thus, unlike for instance coconut, it has several growing points and if growth is arrested at any one point, it is compensated for elsewhere.

Second property relevant to this discussion is the plant's ability to put forth

fresh shoots more or less throughout the year should enough moisture be available. It means that though many fungi have been reported as pathogens, few under normal conditions can cause sustained damage to justify the expense of applying fungicides, an operation all the more difficult owing to the dense and sprawling canopy.

Thirdly, the thick and glabrous leaves, and the bark, are rich in tannin and other phenols which have been shown to be fungistatic and antimicrobial (Bopaiah, Wani and Rai, 1978).

Table II summarizes the more serious diseases of vegetative growth. (For an extensive list of all the microorganisms recorded on cashew to date, see Nambiar, 1979). See also Ohler (1977) for a discussion on cashew concerning quarantine aspects. Countrywise grouping of fungi and other pests reported on cashew is also given in the same paper. Ohler's book on cashew too (1979) has a 7 page chapter titled 'Diseases'.

Dieback or anthracnose caused by *Glomerella cingulata* (Stonem) Spauld et von Schr. is the most serious disease of cashew. The organism is more commonly known by its imperfect stage *Colletotrichum gloeosporioides* Penzig. It has a wide host range. The ecological conditions in which cashew thrives and the particular requirements of the fungus appear to run a close parallel. Agnoloni and Guilani (1977) have discussed the ecology of cashew at length.

The most favourable mean annual temperature for cashew lies between 24 and 28°C (Quino, 1975). Ghouse (1976) found the sporulation to be maximum at 30°C.

The cashew is a sun loving plant and particularly since it bears fruit at the tips of the current year's fruit bearing branches, a good deal of sunlight is essential for a

full harvest; Quino (1975) found that light enhanced sporulation of the fungus.

The majority of cashew tracts lie close to the sea and as such, are exposed to steady winds regularly. Though the sticky mass of conidia is not readily wind-borne, dispersal is known to occur by rain splash (Hindorf, 1975). Given the relatively more turbulent tropical rains, one is tempted to speculate on its role in dissemination of *C. gloeosporioides* spores.

The part of relative humidity is mentioned later. Thus it will be seen how *C. gloeosporioides* can potentially inflict sustained damage to plantations in any given year.

All the foregoing account should not be construed to mean that *C. gloeosporioides* is pathogenic to cashew only because the atmospheric conditions suit it so. Dozens of other species will thrive equally well under similar conditions. But given the genetic apparatus in form of the ability to infect cashew—and many other plants besides—the pathogen is well-equipped to exploit this ability fully.

Various methods of control including planting of wind breaks and regular sanitation (Singh *et al.*, 1967) have been suggested. Copper fungicides, and to some extent captafol, have consistently given good results. Yet it is not economical to undertake spraying for this disease alone. Tea mosquito poses even more serious threat year after year, against which routine spraying is more common. Precise scheduling of such sprays and compatibility studies on insecticide-fungicide mixtures are needed. It may be mentioned here that insects are believed to pave the way for fungi, eg *Phomopsis* and *Rhizoctonia* which were consistently isolated from dieback affected shoots (Dept. of Agriculture, Kenya, 1970) and disseminate fungi (Olunloyo, 1978).

The pink disease is potentially dangerous in that it can destroy entire branches. Control measures include pruning the affected branches well below the site of infection, destroying such branches, and painting the cut surface with Bordeaux paste. Gummosis and canker (*Hendersonula toruloidea* Nattrass) reported from kuttur in Tamil Nadu by Singh and Misra (1980) also appears to have equally destructive potential.

Ramakrishnan's (1955) observation about poor drainage and the ensuing damage by *Pythium spinosum* Savada once again emphasizes proper drainage. He also pointed out that the roots lacked resistance because of malnutrition. Recovery of these plants following a dose of manure and fertilizers thus underscores the importance of proper husbandry practices. (See also Agnoloni and Guiliani, 1977, p. 125.)

The other diseases are not as widespread as dieback. In a few cases, major damage has been attributed to insects, the fungi being either secondary invaders or entering through insect injuries (Indian Council of Agricultural Research, 1950).

### Flowering and Fruit Set

Two points which stand out at once from the stand point of disease control are (1) dependence of cashew on a clear-cut and extended dry spell for successful fruit set and (2) prolonged and erratic fruit development which means that at any given time, there are on a cashew plant fruits ranging from just fertilized to those ready for harvest. This makes spray scheduling difficult.

*C. gloeosporicides* attacks the inflorescence too, particularly when relative humidity is more. The developing apples and nuts are similarly infected. Under the circumstances, a systemic fungicide is necessary and carboxin has given good results (Lima

*et al.*, 1975) while the results are conflicting about benomyl: Lima *et al.* (ibid.) found it effective while Matta and Lellis (1973) did not. The methods employed by these workers were different, however. Lima *et al.* tested the fungicides in vitro while Matta and Lellis did it in vivo. Since both the fungicides move only upwards within the plant, the spray should be directed accordingly; covering blossoms alone may not be effective in all the cases.

Several fungi were implicated in the inflorescence blight. However, Nambiar, Sarma and Pillai (1973) conclusively proved that tea mosquito (*Helopeltis antonii*) is the primary cause and the associated fungi are only secondary saprophytic colonizers. *Botryosphaeria rhodina* (Berkeley and Curtis) von Arx is another serious pathogen which infects cashew blossoms. Immature nuts, if attacked, become dark and fluffy and remain attached to the pedicel for many weeks (Olunloyo and Esuruoso, 1975).

### Conclusions

Cashew suffers from few serious diseases and establishing and maintaining a thrifty cashew plantation is a matter of sound husbandry practices supplemented with a few crop protection measures.

Two hitherto neglected and yet useful aspects which need working out are:

1. Chemical seed treatment—choice of the chemical and method of application.
2. A fungicide to control dieback, compatible with the established schedule against insect pests of cashew and particularly the tea mosquito.

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Mr. G. K. Argles, formerly of the Common- ation Crops, East Malling.

Table I

Diseases of Cashew seedlings

Disease	Pathogen	Reference	Remarks
Damping off	<i>Phytophthora Palmivora</i> (Butler) Butler	Kumararaj and Bhide, 1962	—
Root rot	<i>Pythium ultimum</i> Trow	Olunloyo, 1976	'Dexon' mixed @ 50mg/kg of soil before sowing
Blight	<i>Cylindrocladium scoparium</i> Morgan	Phillip, 1973	Severe in rainy season
Blight	<i>Colletotrichum gloeosporioides</i> Penzing	Matta and Lellis, 1973	Cu oxide and Dithane M-45 0.3%
Wilt	<i>Fusarium udum</i> Butler	1. Small, 1922 2. Joshi, (unpublished results)	Spray and soil drench with Carbendazim

Table II

Diseases of Vegetative growth of cashew

Disease	Pathogen	Reference	Remarks
Anthracnose or dieback	<i>Colletotrichum gloeosporioides</i> Penzing	1. Lima et al., 1975 2. Diaz-Polanco, 1973 3. Menezes et al., 1975 4. Ramachandra, 1969 5. Singh et al., 1967 6. Sundararaman, 1932	'vitsvax' 'Benlate' and other fungicides — Orthodifolatan 4-F 'Blitox', Phytolan', Bordeaux mixture Bordeaux mixture and Bordeaux mixture with ferrous sulphate —
Leaf blight	<i>Diplodidium anacardi- acearum</i> Batista and Cavalcante	Castro et al, 1977 Acquino and Gilson, 1974	— —
Leaf diseases	—	Venkataraman, 1977	—
Decline	<i>Pythium spinosum</i> Sawada	Ramakrishnan, 1955	Cheshunt com- pound, manuring

Desiase	Pathogen	Reference	Remarks
Pink disease	<i>Corticium salmonicolor</i>	Indian Council of Agricultural Berkeley and Broom Research, 1960	—
Shoot rot and leaf fall	<i>Phytophthora nicotianae</i> var. <i>nicotianae</i>	Thankamma, 1974	—
Sudden death	Probably <i>Valsa euginiae</i> Nutman and Roberts	Wallace and Wallace, 1975.	—
Gummosis and canker	<i>Hendersonula toruloidea</i> Nattrass	Singh and Misra, 1980	Proper nutrition, lime wash to pre- vent sun-scorch

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