

# Dodder (*Cuscuta campestris* Yuncker) Infestation in Rubber Plantations

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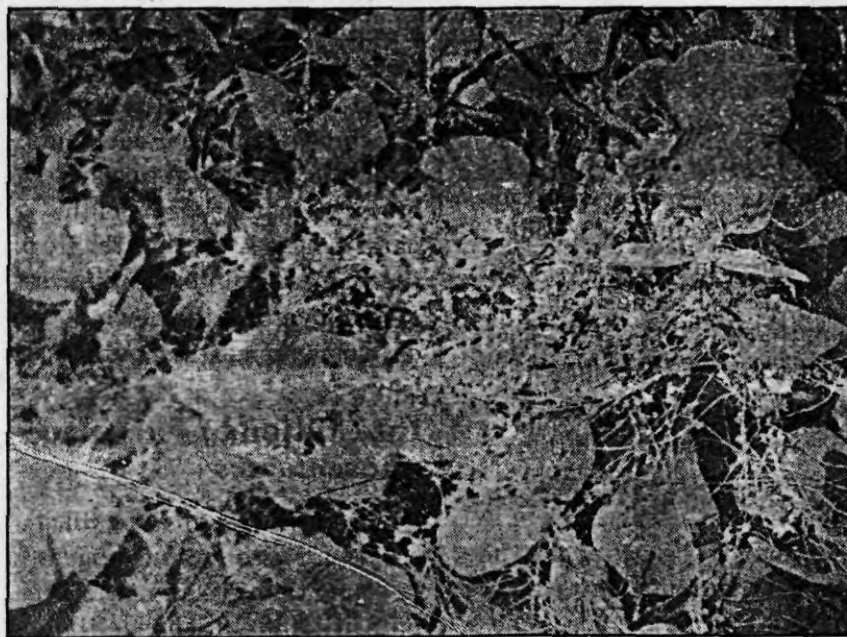
## ABSTRACT

**P**arasitic infestation extensively on *Pueraria phaseoloides* and sporadically on *Hevea brasiliensis* and *Mucuna bracteata* by *Cuscuta campestris* has been reported for the first time. The wide host range, lack of host specificity, quick spreading nature, lack of toxin production to trigger host's defense mechanism and ability to establish organic connection with the host, all contribute to its potential threat as a noxious weed menace to rubber plantations. The parasitic weed at first infests the cover crop and gets access to the rubber canopy through the cover crop vines. Through its innumerable haustoria the parasite extracts nutrients from the host parts gradually weakening it and ultimately killing the affected branches. The parasite is devoid of leaves and roots but profusely flowers and sets seeds which readily germinate. As it is difficult to eradicate it once it has established in a rubber plantation, preventive measures and early control by manual removal of infested plant parts are to be resorted to.

## Introduction

Parasitic infestation of dodder, the noxious flowering plant parasite, has been reported on a number of economic crops in several countries. The weed has got a very wide host range like horticultural crops (including fruits and vegetables), field and forage crops and also ornamental plants. (Mamluk & Weltzein 1978; Beuret 1981; Rao & Gupta 1981; Takabayashi *et al.* 1981). Among the 100 species of the parasite reported worldwide the

three most widely distributed species are *C. australis* R. Br (distributed through Central South and East Asian Region to Australia), *C. campestris* Yuncker (a native of N. America, now common in the Malaysian region) and *C. reflexa* Roxb. (widely distributed in central and South Asia). In Malaysia the presence of the parasite has been reported, (Rajan & Hashim, M.D Noor 1989) but only as a nuisance weed. In



Profuse flowering of dodder

India the occurrence of the parasite has been recorded on a large number of hosts. Coffee plantations have of late been plagued by this plant parasite. Recently the outbreak of the infestation in rubber plantations has been noticed on rubber tree *Hevea brasiliensis* and cover crops *Pueraria phaseoloides* and *Mucuna bracteata*. The parasite has been identified as *C. campestris* Yuncker.

### Occurrence of *Cuscuta campestris* on rubber trees

*Cuscuta* sp. belonging to Cuscutaceae has been found to twine round the young green shoots all over around the stem, petioles and petiolules with the growing tips of the vine hanging downwards in large number of parallel streaks. After vigorously growing for some time on a twig the vine turns to the next twig and repeats the process, ultimately forming a tangled mass. All along the vine, on the side in contact with the host large number of haustoria are produced. Drops of latex are found oozing out from the point of contact. The parasitic vine alone or at times both the parasite and the host tissues are found swollen due to host parasite interaction. No necrosis of host around the haustorial attachment or abscission of the affected leaf is ever noticed. Leaves at the time of wintering remain attached to the vine in tangled mass. The vine continues growth to the

next storey when it unfolds. It is observed that infestation on rubber tree is either from *Pueraria* or *Mucuna* vines climbing on the tree with the parasite on it or from other hosts

golden yellow vines of the weed colony usually circular in outline at the beginning either growing above the cover crop leaves visible even from a distance or underneath on

Table

Height of plants and size of leaves of dodder infested and healthy seedlings of *Hevea brasiliensis*

Treatment	Height of plants in cm.	Size of leaves in cm.		Colour of leaves etc.
		Length	Breadth	
Dodder infested plants	21.17	8.45	2.55	Leaves turned yellowish, withered and dried. Consequently major part of the parasite is also dead. Flowering and fruiting noticed in the parasite. Leaves dark green and healthy.
Control plants	39.93	10.28	3.40	

of the parasite like *Mallotus* sp or *Cerbera odalam* etc. growing on the border of estates. Once the parasite covers the canopy of the tree it is difficult to eradicate it. Once the green tender stem is found to callus at places of attachment of the parasite and later, the green stem turns to brown stem, the portion of the parasite gets killed, but the tip of the vine immediately continues growth to attack the newly developing tender stem and leaves.

### Infestation of *Pueraria phaseoloides*

On vigorously growing thick carpet of *Pueraria phaseoloides* in young rubber plantations, the parasitic infestation is initially noticed as a fine net work of

cover crop vines and petioles, unnoticed from a distance. The colony grows outwards in circumference. The thin strands of the parasite extend outwards twining round the host initially as if for support and once it gets a firm hold, then twines round and round repeatedly until the whole host portion is practically covered by the coils. When the parasitic vine comes in contact with the host, large number of tooth-like projections or prohaustoria are produced on the surface facing the host, which pierce the host tissues and establish permanent organic connection between the two. It is interesting to note that the parasitic infestation does not trigger the defense mechanism of the host



and the absence of necrosis of the host tissue indicates absence of production of toxins by the parasite. After completing growth on the host part for a while, the parasite branches and the branches come in contact with other host parts and repeat the process and as a result the whole growth of *Pueraria* vines in the affected area becomes a single entangled mass, the leaflets sometimes held together in an upright position, not free to maintain their horizontal position. Movement of the leaflets according to the changing position of the sun is made impossible. In areas exposed to the sun the vine at times assumes a yellowish orange tinge. The parasitic plant is devoid of leaves and has no roots, but possesses scale leaves from the axils of which new branches arise. The plant is found to flower profusely from April to September, the flowers produced in panicles, creamy white in colour, pentamerous with four carpels and are insect pollinated. The fruits are small measuring 4 mm across with 4 locules having one seed in each locule. While the infested areas extend in circumference, the central part of the cover crop gets perished along with the parasite, the parasite on the marginal portion continues growth outwards. In young plantations, the covercrop vines were found to climb on to rubber canopies with the parasitic vine on it either by twining round the main stem or through coir ropes

tied to plants to keep in erect position against wind damage.

The leguminous ground cover *Mucuna bracteata* also has been parasitised by the parasitic weed dodder in the same manner. At portions where large number of coils of the parasite are formed

seedlings emerged with neither cotyledons nor radicle. The meristematic tip of the thread-like stem was golden yellow in colour. The seedlings when transferred to pots containing 2 month old seedlings of rubber grew towards them as if attracted and twined round



Dodder twining round rubber leaves and stem

resulting in larger number of haustorial penetration, the host tissues are enlarged owing to the defense mechanism of the host. Vine is also swollen and flattened laterally because of host parasite interaction triggered possibly by the phenolic content of *Mucuna*.

### Seed germination

The seeds of *Cuscuta* sp. measure 1 mm in dia. and are brownish in colour. The seeds when incubated inside moist chamber germinated within 72 hr. Small colourless thread like

them within 24 hr. Within 48 hr they produced haustoria. After coiling round one seedling for a while the vine branched and the branch grew towards nearby seedlings. Within a week's time, all the 8 numbers of rubber seedlings were covered with the parasitic vine and a good number of growing tips extended outwards in search of new unparasitised seedlings. From many points of attachment through haustoria, latex exuded and the drops coagulated there immediately. In a



Flowers of *cuscuta*

few cases even leaf blades were parasitised by dodder. The tooth like projections from the dodder vine produced droplets of some clear fluid, perhaps digestive enzymes which helped to dissolve off the tissues of the host whereby entry of the parasite into the host is made easier. After growth for 4 weeks, the parasite produced flowers and later fruits on the vines. All the host seedlings were held together in a single mass by the parasitic vine. The reduction in height, growth and leaf size of the dodder infested plants in comparison to healthy uninfested control are recorded in the table.

### Anatomical Investigations

It was revealed that the parasite stem is composed of simple parenchyma cells and very poorly developed conducting tissues. The haustorium composed of loosely packed elongated cells with very few

strands of xylem and phloem, were seen to pierce the host tissues and come in contact with the xylem and phloem of the host stem and petiole. The parasite and the host established organic connection enabling the former to drain the latter off the assimilates from the phloem and water and minerals from the xylem.

Identification of the species as *Cuscuta campestris* was done by the Botanical Survey of India, Coimbatore.

### Pest status

Eventhough generally these parasites have only nuisance value, since the parasite has been observed to infest *Pueraria* in the rubber plantations on a very serious proportion and rubber plants and *Mucuna* sporadically, there is every possibility that this pest may assume the status of a noxious weed in the near future. Moreover the absence of production of toxic principles which are capable of triggering the defense mechanism of the host plant is yet another unique property of the parasite which may pose a potential threat to the rubber plantations.

### Control Measures

The pest has to be readily controlled by manual methods while still on the ground on the cover crop. Once established on the cover crop, due to its capacity to regenerate from stem fragments prevention of the pest or eradication in the early stage by cutting and burning has to be resorted to. If it has reached the canopy of rubber, careful cutting and burning of infested branches

have to be resorted to taking care not to contaminate healthy plants and ground cover. This parasitic weed should never be used as a biocontrol agent to suppress other weeds.

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### REFERENCE

- Beuret, E. (1981). Field dodder (*Cuscuta campestris*) a parasite of vegetable crops in the Valais Revue Suisse de Viticulture, Arboriculture, Horticulture, 13 (3); 141-148.
- Mamluk, O. I&H.C. Weltzien (1978). Distribution and host range of some *Cuscuta* strains in the near and middle east. Zulschfr fur Pflanzen Krankheiten Und Pflanzenschutz, 102-107.
- Rajan. A and Hashim M. D. Noor (1989). Dodder (*Cuscuta spp*). A potential threat to Economic crops. The Planter. Kuala Lumpur 65, 176-179.
- Rao, K.N. & K.M. Gupta (1981). Chemical Control of *Cuscuta* in Pulses and other crops. Proc. Eighth Asian Pacific Weed Science Society Conference, pp 217-217.
- Takabayashi, M., H. Sato. T. Furaya & A. Hashimoto (1981) Japan Pesticide Information 38; 3-9.

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