CHAPTER 7

PESTS AND DISEASES OF JUTE

Jute is attacked by a number of pathogens and diseases, throughout its growth period, which inflict loss in yield, both quantitative and qualitative.

7.1 A) Diseases of jute

The most important pathogen of jute is the fungus 
Macrophomina phaseoli which causes "Seedling Blight", "Root Rot", "Stem Rot" and "Collar Rot", depending on the part of
the plant attacked, and the nature of the fungal damage (Fig.
7-1) — seed-borne, soil-borne and air-borne. In the case
of "Stem Rot" and "Root Rot", the stage of fungi were recognised
as Rhizoctonia Solani and Rhizoctonia bataticola respectively.

"Seedling Blight" is caused mainly by the sowing of
infected seed, or the presence of the pathogen in the soil,
favoured by the high soil temperature (40°C) with low soil
moisture (8-16%), low soil pH (5.4-6) and low organic matter
content, found mostly in Hooghly, 24 Paraganas, Maléa, West
Dinajpur, Cuttack, Furnea and the north bank of the Brahmaputra.
Black lesions form on the stem, which dry up, or under humid
conditions, damp off, turn black and rot, and may bear pycnidia.
If the infected capsule/pod splits, the fungus enters, infects
the seeds, and reduces germination. Diseased seeds are lighter
or paler in colour.

Low soil pH (below 6.2) and low K2O/CaO ratio in the
plant, repetition of jute on the same field, K deficiency
in soil, high humidity and temperature above 33°C, dosage
of N above 60 Kg/ha are some of the factors that set the scene
for stem rot.

Lesions on the edge of the leaf soon spread to cover
the whole leaf, travelling via the petiole to the node, spreading to cover the stem, causing "Stem Rot" (Fig. 7-1). The affected part dies and turns brown with numerous infected spores, which, dispersed by the wind, become responsible for the secondary spread of the disease, as found in Cuttack, Hooghly, North Bengal, and Assam in particular.

Lesions longitudinally or horizontally girdling the stem cause the ultimate death of the plant. When these lesions occur in the collar region, they cause "Collar Rot" (Fig. 7-1) a cankerous wound on the stem at ground level, causing breakage of stem and death, common in all jute growing tracts, especially where the soil is slightly clayey.

When the tap root becomes infected by fungus in the soil, (predominantly in red soils, though present in all jute soils) favoured by low soil pH, lack of aeration, water stagnation and potash deficiency, the plant roots wilt, turn brown and then deep brown, the withered roots become dusty brown, and the plant succumbs to "Root Rot" (Fig. 7-1), an epidemic disease in Nowgong and Sorbhog (Assam).

Since *M. Phaseoli* is a facultative parasite which is seed, air and soil-borne, the following control measures have been found effective.

Treatment of jute seeds with organo-mercuric compounds like Agrosan G N and Ceresan (Dry) @ 5 g/Kg of seed has been found to be effective, but due to high cost, they have been replaced by non-mercurial compounds 5 g Capstan Bg, TMTD (Powder) or 2 g Bisdithane or 2.5 g Dithane, M-45 or 3 g Voronit for 10 minutes before sowing (together with liming of soil with low pH and application of adequate FYM).

Air-borne disease organisms leading to stem rot can
be checked by foliar spraying of fungicide viz. copper oxychloride "Blitox" (50% Cu) at 0.75 conc. (also effective for newly infected leaves), at 7-10 days interval, or Bavistin (50% at the W.P) of 0.1% conc. supported by amelioration of soil pH, application of K (25-50 Kg K₂O/ha), at proper spacing 30 cm X 7.5 cm, proper weeding, good drainage, improvement of porosity in clay soils and adoption of jute-paddy rotation.

Some soil-borne pathogen are favoured by soil pH 5.4-6; a dose of 2-4 tonnes of lime/ha is recommended (depending on soil conditions), once in 3 years. Soil amelioration by the application of oilcakes, mustard, groundnut, sesamum at the rate of 20 q/ha, causes growth in the total number of bacteria which suppresses the pathogen and reduces root rot. Dosage of 25-50 Kg K/ha and upto 60 Kg N/ha and incorporation of organic manure reduce the incidence of soil disease and increase its porosity. Removal of weed and stubble minimises disease, while timely weeding and thinning and good drainage reduce leaf infection and mortality. Also, application of Bavistin in soil 20 g/m² or spray @ 0.1% conc, at ground level, helps reduce root rot. Correct rotation practices in avoiding successive rotational crops suffering from the same pathogen should be practised e.g. jute-paddy, jute-paddy-wheat, jute-paddy-potato, jute-paddy-jute-potato-berseem are recommended.

Wilt - is also caused by M. Phaseoli in conjunction with the nematode Meloidogyne incognita, Fusarium sp and Pseudomonas solonacearum, in areas of intensive cultivation practices, where jute is multi-cropped with potato, tomato, brinjal, chillies and so on. The plants become stunted, the leaves turn yellow and the plant dies, if the case is severe. The control is the same as for Hooghly Wilt given next, and soil amelioration with mahua, groundnut cakes, and sawdust at the
rate of 12-15 q/ha has been found effective in reducing root nematode population.

**Hooghly Wilt** - Since 1950 it was observed that the jute crop (especially *olitorius*) suffered from a wilt disease, symptomatically different from that produced by *M. Phaseoli*, the former confined to those fields where potato and brinjal follow jute in the rabi season in Hooghly and Howrah, and is gaining ground in the 24 Parganas and Sorbhog where the above cropping practice (especially jute-potato) is maintained. Waterlogging leads to rapid spread of this disease. The plants attacked by *M. Phaseoli* may survive it, but when this pathogen acts in conjunction with *P. Solonacearum var asiaticum*(Smith) stapp., and *Fusarium solani* (Mart) Sacc., death may result. Infected plants become soft and, on pressing, exude a slightly turbid or slimy material full of bacteria. Soft brown patches spread on the stem, which quickly loses its green colour and turns black and is covered with spores of *fusaria*. Plants are also attacked by root rot which they can survive a while, but if all pathogens are present in combination, death is rapid.

Application of 3 Kg K/ha reduces disease incidence as also does spraying with Bavistin 0.1% conc. Soil amendment with mahua, groundnut cake and sawdust cake (12 Kg/ha) effectively reduces the nematode population. Nematicides are recommended (e.g. Nemagon 35.1/ha) for pre or post-sowing applications, with light irrigation. But for absolute elimination of the disease, clean cultivation is imperative. Since rotting potato tubers and plant debris of potato and jute provide shelter for the pathogen, they should be collected and burnt, and for the same reasons, good drainage should be arranged and waterlogging avoided. Replacement of potato by aman paddy
and jute by aus, and the adoption of the jute-paddy, jute-paddy-wheat combinations reduced mortality from 32% to 4% between 1952-53 and 1954-55. Also, since capsularis is not susceptible to wilt, its cultivation (especially its disease resistant varieties) should be encouraged.

Minor Jute Diseases

Soft Rot - found in both species, starts in mid-July, and gains in severity by harvesting time. The disease is caused by Sclerotium Rolfsi Sacc, and is prevalent mostly in Assam and North Bengal, pathogen growth encouraged by hot, humid weather and jute plant debris.

Wet, soft brown patches (differing from "collar rot" in the softness of the lesions) appear on the basal region of the stem, just above ground level, the peeling-off bark exposing rusty brown, damaged fibre layer, white feather-like growth of the fungus, with or without the mustard-shaped and sized sclerotia. The plant breaks off at the points of infection.

Deep ploughing or burning of jute stubble kills the fungus by exposing the lower surface. Spraying copper oxychloride (50% Cu) on the basal region and ground checks the spread of the disease.

Anthracnose - caused by Colletotrichum corchorum in white jute and Colletotrichum gloeosporioides in tussa jute, was first observed prior to 1952 at Chinsurah in an epidemic form in Jap Rey, an exotic variety of capsularis (caused by C. Ikata and C. Tanaka). It spreads from the pores in the stem dating from hot, humid days (temperature above 33°C, humidity 84% and above, high dose of N) of late July and is most widespread in late August. Initially, small brownish-black spots (black in olitorius) cover the stem, which coalesce
to form cankerous tissues. Stems break at infected points and die, when such tissues yield to the weight of the crown or to the strong wind. Olitorius pods shrivel, due to fungal attack, affecting fibre yield.

Copper oxychloride (50% Cu) at 0.75% conc. should be sprayed at the initial stage of infection, followed by 2-3 sprays at intervals of 7 days. The growing of disease-resistant varieties like D 154 and JRC 212 has been recommended. In the case of olitorius, the disease is particularly virulent in Assam, (especially prevalent where fertiliser dosage is over 60 Kg N/ha), affecting over 60% of the crop, but mortality is low; soil amelioration with lime (where pH is lower than 6.2) @ 22 Kg K/ha and spray of oxychloride at 0.75% conc (at the initial stage) is recommended.

**Black Band** - or "die-black" disease is caused by Diploodia Corchori Syd in both species (Botryodiplodia thebromae Pat in olitorius) prevalent in mid-July, when the plant is mature, as described by Shaw (1921). Sooty spore masses develop all over the stem (and even adhere to the fingers on touching) which eventually appears black. Affected areas are Terai/red soil areas, low in fertility and soil moisture. Early sown crops escape the attack of the disease, which is common among those crops where early harvest does not take place. 2 irrigations, coupled with maintenance of proper soil fertility and spraying of copper oxychloride @ 0.5% conc., failing which, early harvest is recommended to check spread of this disease.

"Sooty Mould" occurs in seed crops, more particularly in the north-east and mid-eastern regions, promoted by heavy dew or rain and accelerated by cloudy conditions. The infection starts with sooty or brown mycelial growth on pods of both
species, which shrivel up, with little, if any seed setting taking place at all.

Since the disease is caused by the fungus Corynespora Cassicola which is sensitive to copper, a spray of copper oxychloride (50% Cu) at 0.75% conc., is recommended on seed multiplication farms.

**Mildew** - caused by a species of Oidium (Varadarajan, 1944) in all areas of capsularis and olitorius jute, is manifested at the pod stage by a very thin cobwebby, somewhat translucent mycelia cover over the leaves and pods, (presenting a chalky, powdery appearance) which fall off and shrivel up, respectively. Though of minor import to the fibre crop, it seriously affects the seed crop, which it attacks in late August up to the harvesting of seeds. This can be checked by lime-sulphur dusting (@ 3:1) especially in the early hours of the morning (when dew effectively arrests particles) and by ensuring clean cultivation.

**Leaf Mosaic** - is a virus infection, which usually attacks all capsularis plants but is most prevalent in Assam and North Bengal (in Assam, the Bemesia tabaci probably acts as vector). A mosaic of green and yellow develops on the leaves which crumple and crinkle to various degrees, and in extreme cases, plants are stunted and killed.

Since the pathogen is pollen and seed transmitted, infected plants must be weeded out and burnt on seed multiplication farms. In Assam and North Bengal, a prophylactic spray of Foliodol Ebos @ 1 ml/5 l of water or Endrin (20 EC) @ 7.5 ml/5 l of water is recommended for killing the vector. More recently, an economical prophylactic spray of Rogor (0.5%), Metasystox (0.02%) or Dimecron (0.05%) is being
recommended.

**Sun Scald** - is a physiological disease (caused by high temperatures) particularly prevalent in *olitorius* jute. The tip of the leaf turns brown and this spreads towards the petiole.

**Stem Gall** - is caused by *Physoderma corchori* (Lingappa, 1955) on *olitorius* jute in the Terai and lowlying areas of UP and Tripura, facilitated by alkaline soil, waterlogging in early stages for at least 3 days and late sowing. Green galls develop on young stems, which later turn rusty brown and the plants wither and die. To check the spread of this disease, farmers should restrict *olitorius* to high land, deep plough the field and ensure timely sowing.

JRC 321 was found to suffer from a stem rot caused by a fungus identified as *Corynespora Cassicola* (Berk & Wei) which infected patches on the stem covering 4-5 nodes and intervening internodes. The advancing zone is light grey to dark, while the central part is sooty dark, at which stage conidiophores with **condia** could be seen. The infection seems to start at the leaf and in the advanced stages, the stem breaks and the fibre is shed.

7.1 B) Control of Diseases in jute

During 1977, 4 fungicides were tested—Bavistin, Dithane, M-45 Macupraux and Bentate, of which the first was found to be the best, bringing down disease from 1.08% in control to 0.06%.

In 1978, Macupraux was replaced by copper oxychloride and Dithane M-45 omitted. In 1979 it was confirmed that on average, Bavistin provided the maximum protection, disease incidence being 2.8% on-y, Bentate (8.2%), Agrosan G N (9.8%),
Copper oxychloride or Blitox (10.5%) against control, respectively.

Again, an examination of the cropping patterns elicited the fact that root and stem rot are minimum in Jute-paddy-potato (2.5%) and jute-paddy-groundnut (2.6%), whereas moong-jute-paddy-potato recorded maximum incidence (18%) - refer Chapter 6.

Among other fungicides tested, at 100 ppm treatment, Dithane M-45 exhibited toxicity towards M. Phaseoli, D Corchori and Colletotrichum; Hexaferb inhibited all save the third; Ensan 6 all, save the last; Bentate and Bavistin almost all; Panolil all, save the last, at 500ppm, and the last at 2000ppm; the last was inhibited by Panoram at 1000ppm and Blitox at 5000ppm.

Six varieties (JRC 412, 212, 321 and D 154 and JRO 632 and 878 were tested to see the effect of 3 sowing dates in mid-March, end March and mid-April, on disease occurrence from 1970-72. Maximum disease incidence was found to occur in mid-March, least at the end of March. In mid-March, stem rot recorded 56% incidence - JRO 878 (25%) and JRO 632 (22%).

Since a complete survey of jute disease has never been undertaken, the status of various diseases and problems faced in different regions are not properly known. Once this information is available, corrective breeding for disease resistance, production of better fungicides can be effected, if with constant vigilance, timely adequate protective measures can be administered, to prevent substantial losses.

7.2 A) Pests of jute

Jute is prey to a number of pests which occur successively, damaging almost all parts of the plants. Jute pests
<table>
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<th>LOCATION</th>
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<th>PERIOD OF OCCURRENCE</th>
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<td>1.6.78 to 24.9.78</td>
<td>24.7.78 to 30.7.78</td>
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Source: Progress Report of the All India Co-ordinated Research Project on Jute and Allied Fibres, 1978, ICAR.
are discussed below, classified according to their occurrence
in the stage of jute growth.

**Early Stage :**

**Indigo Caterpillar** - Plants of 1-1/2 month crop
age in both species are susceptible to damage at the seedling
stage by the attack of the Indigo Caterpillar (*Spodoptera
Laphygma exigua* Hbn), commonly known to the farmer as "Kathri".
It is most prevalent in West Bengal and Orissa, effecting
maximum destruction between March, April and May (later in
West Bengal), so late sown crops may escape its attack to
some extent (Table 7-A). The pest remains in the field for
barely a month, attacking top leaves first.

The pest is a dull greenish-yellow caterpillar (smaller
than the semilooper), which in the early stage, being grega-
rious, feeds on epidermis tissues by webbing up the leaves
or joining two or more adjacent leaves. At a later stage,
the pest is ash-coloured, 2 cm long, coiling at the slightest
touch. It starts feeding, making holes on the upper portion
of leaves, preferably, through which food is distributed.
Its subsequent migration causes total defoliation of the
plant.

Damaged plants should be removed at the time of thinn-
ing or spraying. In 1948-49, DDT, 0.2% and 50 W.P. 0.25%
Gamma BHC proved effective, but has currently been supple-
mented by spraying of any of the following pesticides :-

(a) Endosulfan 0.075% @ 21.4 ml/10 l of water (b) Leptophos
0.075% @ 22 ml/10 l of water (c) Chlorfenvinphos 0.04% @
16.6 ml/10 l of water (d) Monocrotophos 0.04% @ 10 ml/10
l of water (e) Endrin (0.04%) (f) Fenitrothion (0.04%) (g)
Ambithion (Table 7-B).
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<th>TREATMENT</th>
<th>STEM WEEVIL</th>
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<th>YELLOWMITE</th>
<th>FIBRE YIELD</th>
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<td>(%) a.i.</td>
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a) Kendrapara  b) Katihar  c) JARI  d) Bahraich

Source: Progress Report of the All India Co-ordinated Research on Jute and Allied Fibres, 1978, Table CD (JF) 1.0-1, Pg. 140, ICAR.
Thrips - (Ayyaria chactophora Karny) mostly attacks olitorius jute at the seedling stage, while capsularis is totally resistant. Pests are minute in size, black in colour and generally avoid light, remaining in the fold of apical buds from which they draw nourishment. During feeding, they macerate the leaf tissue between veins, and when the infected bud begins to unfold, the pests move up to the next, destroying all buds in regular succession. The macerated tissues soon die, manifested as prominent white streaks in unfolded leaves. Pest incidence is more when the weather is warm and humid with intermittent dry spells.

Spraying with (a) BHC 0.05% (50% W.P.D.) 0.1% (20 gm/10 l of water) has been tried with positive results (b) Formothion 0.04% (16 ml/10 l of water) (c) dusting with 5% BHC @ 20 Kg/ha.

Burrowing Field Cricket - (Brachtrypes achatinus Stoll) was a minor pest when recorded by Das in 1948, but has recently been reported to have caused extensive damage to jute seedlings in loam and sandy-loam areas in Assam and North Bengal, affecting crops sown from March to mid-May.

The pest has a 4 cm long body, is light to dark brown in colour, is strongly built and possesses a pair of mandibles which help in cutting seedlings at ground level. It builds livable burrows in the field to which it drags the cut ends, at night, but is seldom detected by day.

(a) In endemic areas, pre-sowing soil treatment is done with 3% Heptachlor dust or 5% Aldrin dust @ 30 Kg/ha for seed-bed preparations (b) in off-season, burrows found on land can be treated with Aldrin 30 BC @ 16.5 ml/5 l of water or BHC 50 WP 20 gm in 5 l of water in the standing
FIG 7-2 STEM WEEVIL

JUTE PESTS

FIG 7-3 RED MITE

FIG 7-4 YELLOW MITE
crop; poison baiting with 10 Kg wheat/paddy bran with 500 gm gur or molasses and 300 gm Aldrin 50 W.P. has been found effective.

**Stem Weevil** - (Apion Corchori Marshall), commonly known as "Bichan" causes damage to early sown *capsularis* in all jute areas. The disease incidence starts from the seedling stage (12-15 days crop age) (Fig. 7-2).

The adult is a tiny black weevil which can easily escape notice, its presence detected only by its feeding habits. The female weevil first feeds on top leaves, making holes in them; then the apex of the shoot in young plants is preferred. Later, as the plant grows, the site of oviposition changes from the apex to the nodes. The female punctures or bores a hole in which she lays the eggs, which hatch within 3-4 days into grubs that tunnel and burrow into the pith, damaging fibre-tissues, with loss of terminal growing point, destruction of axillary buds below the puncture, causing undesirable branching below the punctures, (producing short, specky fibres) and outright killing of seedlings sometimes. The grubs remain stationary, the seat of activity marked by a dark spot with occasional swelling of surrounding tissues. (Fig. 7-2). Mucilage exuded from the point of injury together with grub excreta, bind the fibre bundles and adjacent tissues into a compact mass, which does not ret properly and ultimately forms 'knots' a defect in fibre quality. At later stages, the plant may become stunted and branch, which is undesirable.
Control is difficult, as its early life is spent deep within the stem, but if insecticides are applied at the start of infestation, damage can be reduced. Firstly, since *olerarius* is more resistant, there should be varietal replacement of *capsularis* with *olerarius*.

Seedlings may be treated with DDT 0.2% (DDT 50 W.P. @ 2 Kg/ha) or Endrin 0.03% (Endrin 20 E C @ 750 ml i.e., 3-4 times at an interval of 15-20 days).

A 3-spray schedule at 15-20 days interval with any of the following insecticides, the first spraying just after infestation (especially of the upper part of the stem)—is beneficial.

(a) Endosulfan (b) Leptophos as in Indigo Caterpillar (c) Penitrothion 0.1% (20m / 10 l of water) (d) Phosalone 0.075% (21.4 ml / 10 l of water) (e) Chlorfenvinphos 0.04% (16.6 ml / 10 l of water) (f) Toxaphene (0.1%). Table 7-C reveals (a) to be the best control measure.

**Pests of the Middle Stage**—have been studied by Das (1948), Kundu (1959) and Tripathi (1967).

**Red Mite**—(*Oligonychus coffeeae* Nietner) Its incidence is of sporadic nature, but on occasion, has caused severe damage, especially in *capsularis* jute. Its occurrence depends on weather factors, intermittent showers, followed by a dry spell being favourable, so March-April sown crops are the worst affected (though the disease does not manifest itself at the start of the showers).

Eggs are laid on the underside of leaves, which are affected by continuous feeding of nymphs and adults (visible as tiny red dots to the naked eye) which suck the plant juice.
Spraying at 15 day intervals, drenching the underside of the leaves especially, with the following, can check this problem.

(a) Binapacryl 0.04% (10 ml/10 l) (b) Dicofol 0.04% (22 ml/10 l) (c) Carbophenothion (0.04), Dimethoate (0.2%) and Phosalone (0.04%) (d) Lime-sulphur is the cheapest and an efficient solution.

Yellow mite - (*Hemitarsonemus Latus* Banks), studied by Das (1948) and Dutt (1958), had been found prevalent in *olitorius* (Sudan Green, JRO 632 and 878 being most susceptible) rather than *capsularis*. When occasional light rain keeps relative humidity high, conditions are favourable; 5 days are required to complete the pest's life-cycle.

Being of minute size, they escape the attention of growers. The adult nymphs attack apical leaves still folded, sucking up plant juice from the ventral surface of leaves, which, in the early stages present an oily look, but in the case of severe infestation, crumple and curve along the midrib, downwards, change in colour to dull green with coppery brown shades and fall off prematurely. The attack arrests growth, shortening plant internodes and sometimes induces branching. Newly emerging leaves are also infected and the sequence is repeated (Fig. 7-4).

Control can be established by (i) dusting with lime-sulphur mixture (3:1) @ 20 Kg/ha and (ii) a 3-spray schedule at 15-20 day intervals, drenching the central portion of the leaves especially, with any of the pesticides given below, (a) being the best choice (Table 7-C): Endosulfan 0.04% (11.4 ml/10 l of water) (b) Lime Sulphur 1% (100}
Leaf Defoliator - *Myllocerus discolor* Boheman was a minor pest, but is now a major one, causing severe damage to crops. The adult grey-coloured weevil feeds on folded *olitorius* leaves, which, when unfolded, resemble the damage caused by the semilooper, except that the edges of the lamina are not eaten by the weevil. In severe cases, defoliation is complete. Endosulfan spray 0.075% (21.4 ml/10 l of water) can control this disease.

Root Knot Nematode - *Meloidogyne incognita* kofoid was reported by Bessey (1911), Kundu (1946), Chattopadhyay & Sengupta (1955) and recorded by JARI (1954-67) as a growing menace to both crop types, (but especially prevalent in *capsularis*) in sandy loam and loam areas of intensive cultivation.

The damage is caused by numerous small larvae and thin worms, microscopic in size, inhabiting the soil, which puncture the root under favourable conditions, causing the formation of numerous swollen "galls" or bacterial nodes, hampering translocation of nutrients through the root, stunting plant growth. In severe cases, association with *M. Phaseolii* causes leaves to become yellow and chlorotic. Ultimately the plant wilts and withers away.

At the time of harvest, since the maximum population of nematodes remains inside the root, the latter should be uprooted, collected and burnt. The infested field should
be ploughed 2-3 times, and may be kept fallow. Susceptible crops e.g. pulses, potato, brinjal, tomato, bhindi should be avoided in the infested field.

Nemagon 60 W/W applied with irrigation water as pre-plant application (37.5 l/ha) followed by another application, a month after planting (18.7 l/ha) gave satisfactory results (Tripathi & Bhattacharya 1969), are easily applied and effective.

**Pests of the Last Stage**

**Jute Girdler** - (Nupserha bicolor post Brunea Dutt) studied at JARI, 1959-62 and by Dutt, 1926-61), mostly attacks *olitorius* jute (Chinsurah Green most susceptible). Emergence depends on sufficient rainfall (earlier rainfall conducive to earlier emergence), but in general, occurs by the second week of June. For oviposition, the female cuts the cortex with its mandibles at 2 points, making 2 circular rings about 1 cm apart, around the stem, in between which she lays her eggs, thrusting them deep into the pith. (Fig. 7-5).

60 eggs are laid singly over a month's period, which hatch 3-4 days later into larvae (1.4 cm long when grown up), the total larval period being 20-50 days. After girdling, the portion of the plant above the lower girdle begins to wither, droops down and dies. These larvae can remain dormant in the soil for over a year, 70% emerging as adults when RH is 97%.

Control involves spraying the apical portion with either (a) Endosulfan 0.075% (21.4 ml/10 l of water) (b) Methyldemeton 0.04% (16 ml/10 l of water) (c) Dimethoate 600 ml/500 l of water/ha (d). Recently, encouraging results have been obtained with Folidol (0.01%), Diazinon (0.015%),
FIG 7-5 JUTE GIRDLER

FIG 7-6 SEMILOOPER

FIG 7-7(i) HAIRY CATERPILLAR
Metastystox (0.05%) and Endrin (0.03%).

Parasites feeding on such larvae are Napcato laccus nupserhae (Dutt & Fern), Ptermaliadae, goryphus sp (Inchnaino-nidae) Ipobracon sp (Praconidae), Spathius sp (Bracunidae; Epibracon (Braconidae) and Morbanus acuminatus Dutt and Fern (Pteromalidae), the first and last being the most important.

Semilooper - (Anomis sabulifera Guen) commonly known as "chitapoka" is widespread in both species. It was first recorded by Lefroy (1906, 1907) followed by Chaudhury (1933), Patel & Ghosh (1940-5 and Tripathi (1945).

It usually appears in the last week of June-first week of July (Table 7-A), so 25% of the crop raised in May-early June is prone to its attack (Dutt 1952), whereas over 75% of late sown crops are similarly afflicted. (JARI 1949-54). A delayed monsoon preceded by early showers seems to favour the outbreak of the pest in severe form.

The dusky coloured moth does not injure the plant. The female moth lays its slightly green eggs on both sides, but prefers the underside of the leaves, from which within 3 days emerge the 1-1.15" long, green, yellow-green semilooper caterpillar, forming a loop in the body during forward movement. (Fig. 7-6). The caterpillar stage lasts 9-16 days, the pupa stage about a week. The young larvae feed on the superficial membrane of tender crown leaves, initially not destructive, but as they grow, they become voracious eaters, capable of damaging at least 10 plants a day (by biting off leaves and making holes in the margin, besides destroying apical buds and causing branching); 95% of the damage is up to the ninth leaf (Dutt 1958). Each season records at
### Table 7-C

**Relative Efficiency of Insecticides Against Jute Pests**

<table>
<thead>
<tr>
<th>Treatment (in % a.i.)</th>
<th>Red Mite</th>
<th>Hairy Caterpillar</th>
<th>Fibre Yield (in g/ha)</th>
<th>Indigo Caterpillar</th>
<th>Fibre/Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(A)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endrin (0.04)</td>
<td>a 1.52</td>
<td></td>
<td>37.10</td>
<td>b 3.68</td>
<td>8.34</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penitrothion (0.04)</td>
<td>a 9.50</td>
<td></td>
<td>34.31</td>
<td>b</td>
<td>8.23</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endosulfan (0.04)</td>
<td>a 5.26</td>
<td></td>
<td>33.25</td>
<td>b 5.86</td>
<td>9.66</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorfenavinphos</td>
<td>a 7.27</td>
<td></td>
<td>34.43</td>
<td>b 4.83</td>
<td>9.06</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosalone (0.075)</td>
<td>a 1.11</td>
<td></td>
<td>32.59</td>
<td>b 4.12</td>
<td>11.23</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>a 21.52</td>
<td></td>
<td>29.61</td>
<td>b 14.48</td>
<td>6.72</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Approximate Figures

**Source:**

A. Progress Report of the All India co-ordinated Research Project on Jute and Allied Fibres, 1976, ICAR

B. Progress Report of the All India Co-ordinated Research Project on Jute and Allied Fibres, 1974, ICAR.
least 3 waves, of which the second brood causes severe damage between early July and mid-August. In severe cases, the top is completely defoliated, and later, the pest feeds on pods and unripe seeds of both species.

In the forties, DDT and BHC were found effective (90% mortality) but subsequently, Parathion was preferred for rapidity of control.

A 3-spray schedule at 15-20 day intervals, drenching the upper leaves thoroughly may be effected with any of the following, the first (a) being undoubtedly the best treatment (Table 7-C) (a) Endosulfan 3.075% (21.4 ml/10 l of water) (b) Leptaphos 0.075% (22 ml/10 l of water) (c) Phosalone 0.075% (21.4 ml/10 l of water) (d) Chlornfenvinphos 0.04% (16.6 ml/10 l of water) or 0.06% (e) Mocrotophos 0.04% (10 ml/10 l of water) (f) Toxaphene (0.1%) (g) Fenitrothion (0.06%).

Parasites viz. Sisyropaformosa (Tachinidae), Tricholiga sorbilans lito mastix sp (Encyrtidae) were observed on the larvae of the pest.

**Jute Hairy Caterpillar** - (Diacrisia obligua Walker) was first noted by Lefroy (1906-07), followed by Woodhouse (1913), Chaudhury (1933), Das (1948) and Kundu et alia (1959). It is most prevalent in the heavy rainfall areas of Bihar, north Bengal, Assam and Tripura, but elsewhere is of sporadic nature. From early June to early October, 3 generations are bred (Table 7-A).

The orange female moth deposits eggs in a cluster (on the lower surface of the leaves), which, within 4-5 days, hatch into caterpillars, initially gregarious and clustered, feeding on the leaves which they reduce to skeletons. At
this early stage, they are easy to locate in the field and destroy by plucking the leaves and dipping them in a bucket of kerosinized water or burning them. Later, the grown-up caterpillars, orange with black head, legs and posterior covered with innumerable long hairs, disperse in the field, after 3 months, skeletonising leaves, stripping them off from margins, resulting in total defoliation and destruction of the apical bud (Fig. 7-7i).

Destruction at the early stage is possible by burning/kerosinizing; when dispersed, control is only possible by insecticidal spray at 15-20 day intervals, the choice listed below:

(a) Endosulfan 0.075% (21.4 ml/10 l of water) (b) Carbaryl 0.1% (20 gm/10 l of water) (c) Penitrothion 0.1% (20 ml/10 l of water) (d) Folidol E-605 6 4 ml/5 l of water.

Tripathi (1966) concluded that Endosulfan and Parathion were 1.6 and 1.15 times more toxic than Endrin.

Mealy Bug - (Ferrisia virgata CA 11) recorded by Das (1948) and Kundu (1959) was first seen in Dacca in 1944, feeding on the sap of leaf, petiole, pod and stem. Repeated attack by gregarious nymphs cause a crust to develop, facilitating resistance of fibre bundles to separation during retting, leading to 'barky' fibre. The pest's body is covered with white meal and glassy threads. It makes its appearance in July and August, just before the crop starts budding and reaches maximisation in seed crops, which it seriously damages, (being transferred to jute by wind).

Dutt and Ganguli (1956) and Kundu (1959) noted another species of mealy bug, Pseudococcus filamentosus var corymbatus causing serious damage to both varieties. It was observed
in Baduria (24 Parganas). Injury arrests vertical growth of the stem and the attacked region is distinguished by green colour, swelling and shortened internodes, any leaves that may arise from the infected portion showing a bushy appearance. The predator, scymnus (pullus) pallidicollis, is effective in checking this pest. Nicotine Sulphate 1.5% and Folidol 0.005% have been found effective, too.

In the case of the Scale insect (Pinnaspis sp) recorded by Dutt (1952c) on capsularis, young nymphs after hatching, move about 30-40 hours to fix themselves permanently to host plants from which they draw nourishment. The predator scymnus pallidicollis is found feeding on this insect too.

Banerjee and Dutt (1952) recorded Cleoporus Lefevrei Duviv, a new pest on olitorius jute in 24 Parganas. It is a small-sized beetle which damages the apical portion of the stem and bark. Just above the point of attack, the shoot withers and ultimately droops down, the branching arresting growth, so the fibre-yielding capacity is lowered. DDT at 3% controlled the pest.

Banerjee and Dutt (1953) identified another pest, (Nodostoma bengalense Duviv var) which damaged olitorius in 1952. The 41/2 mm long insects attacked leaves only and were controlled by DDT spray.

Dutt and Mitra (1953) recorded another pest, Epicauta sp., on capsularis jute in the Himalayas, near Siliguri in 1949, where gregarious adults caused damage to apical leaves. The absence of a larval host checked the spread of the attack in the plains.

7.2 B) Strategy of Pest Control

The above account reveals that the most common pest
### TABLE 7 - D

CONSORTIATED RESULTS ON APION AND SEMILOOPER

<table>
<thead>
<tr>
<th>Station</th>
<th>Major Jute pests</th>
<th>Jute variety</th>
<th>Av. no. of Punctures per Plant</th>
<th>Loss in Fibre Yield (in %) 1978</th>
<th>1979</th>
<th>1980</th>
<th>Av. loss in fibre yield (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JARI</td>
<td>Apion</td>
<td>JRC 212</td>
<td>9.14</td>
<td>31.30</td>
<td>22.95</td>
<td>23.00</td>
<td>25.75</td>
</tr>
<tr>
<td>Kendrapara</td>
<td>Apion</td>
<td>JRC 212</td>
<td>10.40</td>
<td>36.30</td>
<td>37.50</td>
<td>28.57</td>
<td>34.12</td>
</tr>
<tr>
<td>Katihar</td>
<td>Apion</td>
<td>JRC 632</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>34.72</td>
</tr>
<tr>
<td>Nowgong</td>
<td>Semilooper</td>
<td>JRC 212</td>
<td>-</td>
<td>15.43</td>
<td>21.43</td>
<td>25.29</td>
<td>20.71</td>
</tr>
<tr>
<td>Bahraich</td>
<td>Semilooper</td>
<td>JRC 632</td>
<td>-</td>
<td>25.47</td>
<td>22.62</td>
<td>11.46</td>
<td>19.85</td>
</tr>
</tbody>
</table>

Source: Progress Report of the All India Consolidated Research Project on Jute and Allied Fibres 1980, Pg. 160-ICAR

### TABLE 7 - E

8 SPRAY SCHEDULE SUGGESTED FOR PEST CONTROL

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Semilooper (%) a.i.</th>
<th>Yellowmite</th>
<th>Stemweevil</th>
<th>Fibre Yield (in g/ha)</th>
<th>1978</th>
<th>1979</th>
<th>1980</th>
<th>Value of Fibre (at Rs.125/q)</th>
<th>Cost of Pesticide</th>
<th>Net Gain</th>
<th>Net Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endrin</td>
<td>0.04</td>
<td>6.71</td>
<td>11.19</td>
<td>27.20</td>
<td>24.23</td>
<td>-</td>
<td>-</td>
<td>3,030</td>
<td>160</td>
<td>2,570</td>
<td>312</td>
</tr>
<tr>
<td>Lime Sulphur</td>
<td>1.0</td>
<td>5.95</td>
<td>13.79</td>
<td>29.76</td>
<td>26.24</td>
<td>-</td>
<td>-</td>
<td>3,280</td>
<td>140</td>
<td>3,140</td>
<td>582</td>
</tr>
<tr>
<td>Sol, Endrin</td>
<td>0.30</td>
<td>12.30</td>
<td>14.92</td>
<td>14.13</td>
<td>23.24</td>
<td>-</td>
<td>-</td>
<td>2,919</td>
<td>168</td>
<td>2,751</td>
<td>193</td>
</tr>
<tr>
<td>Endosulfan</td>
<td>0.02</td>
<td>13.68</td>
<td>37.98</td>
<td>37.98</td>
<td>22.64</td>
<td>-</td>
<td>-</td>
<td>2,631</td>
<td>270</td>
<td>2,361</td>
<td>197</td>
</tr>
<tr>
<td>Carbaryl</td>
<td></td>
<td>21.49</td>
<td>16.38</td>
<td>55.53</td>
<td>20.46</td>
<td>-</td>
<td>-</td>
<td>2,558</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: 1. Tripathi, 1967
2. Tripathi and Bhattacharya, 1969
of both species of jute was the indigo caterpillar followed by the stem weevil, mite, semilooper and hairy caterpillar; red mite affected *capsularis* mostly, while yellowmite attacked mostly *olitorius* jute.

At present, the stem-weevil and semilooper are the major pests of *capsularis* jute, whereas yellowmite and semilooper are more prevalent in *olitorius* areas, the exact loss in fibre by these 3 major pests tabularised in Table 7-D and 7-E (as per JARI).

Since the incidence of different crops overlap, it is economic to orient prophylactic and curative measures against all pests taken together. So an 8-spray schedule for broad-spectrum control of major pests with minimum uses of insecticides was evolved - Table 7-E (Tripathi, 1967, Tripathi and Bhattacharya 1969a). More recently, an approach involving Monocrotophos 40EC (0.05%), Methyl parathion 50EC (0.05%) or Quiralphos 25EC (0.05%) spray (maximum 3 sprays, depending on intensity of infestation) has been recommended for effective control of stem weevil, yellow mite and semilooper, in the entire jute belt.

Experts opine that plant protection measures together with row cropping and fertiliser dosage at 45 Kg N/ha yielded 7.51q/ha over control, and together with NPK, 8.13 q/ha over control. Table 7-D has indicated the loss in fibre caused by pests, and Table 7-E, the efficacy of applied pesticides in reducing amount of infestation.

Still, a look at Table 7-F reveals that despite a gradual increase in coverage under Plant Protection Measures, in 1982-83, only 4% of jute area enjoyed these facilities, of which, data is mainly available for West Bengal, Bihar...
and Assam. West Bengal leads (35%), followed by Assam (20%) and Bihar (7%). In total, only about 18,000 ha of jute area are provided with plant protection. At the district level, in 1985, Cooch Behar had the largest coverage under plant protection measures (Fig. 7-7).

One of the basic constraints to the rapid increase in coverage may be the cost of the input, which varies between 2-3% of the total cost structure of jute, involving 0.3-0.67% of the labour, or the lack of regular assured supply of the input, or even, toxicity hazards. Though Rs. 7,90,000 was allotted in the Sixth Plan for extension under plant protection, none of it was utilised. However, the adoption of pest control measures depends upon the incidence of disease and pests.

At present, in view of the complex problems associated with keeping the ecological balance, rather than run the risk of creating toxic hazards for living creatures, attempts should be made to integrate cultural, biological and chemical methods of control, so that a less hazardous, more economical and most effective scheme for pest management in jute can be effected.