
Confrontation with *Macrophomina phaseolina* (Tassi) Goid

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Who is she ?

Macrophomina phaseolina is a melodious name of a familiar filamentous lady. She has been seen and known by mycologists in almost all countries in the tropical, subtropical and temperate zones. She has been found with at least 231 willing and unwilling hosts. This large number confirms she is behemian and that she chooses only weak victims. This has been admitted by all mycologists who chased and pried into her habits.

She had confused mycologists for a long time. Nobody knew her name or surname nor her real identity. In 1916, Sawada found her in a pycnidial attire clinging fast on jute in Formosa. He gave her the name *Macrophoma corchori* Saw.

Already there was whisper amongst mycologists that Madam *phaseolina* discards her pycnidial mantle and disguises herself in a sclerotial attire and goes underground when conditions are unfavourable ; in absence of a suitable victim to fleece, she lives a life of a saprophyte. (I know she happily conceals herself in jute stubbles). This disguise-a sclerotial stage-found on jute-was identified as *Rhizoctonia solani* Kuhn by F. J. F. Shaw in 1912. But Sawada-the detective, believed he saw the same sclerotial disguise on jute and declared that the black sclerotial form was another disguise of *Macrophoma corchori*. Shaw confirmed Sawada in 1924.

One Englishman who came into the fray was S. F. Ashby. He too was infatuated by the dubious charms and nature of the filamentous lady. He pursued her and

demonstrated that *Macrophoma corchori* Saw, *Macrophoma phillippines* Petrak and *Macrophoma phaseoli* (Maublanc)—all were names given to one and the same lady. He renamed her *Macrophoma phaseoli* (Maubl.). But changing the name did not end there. One wants to, and loves to give a sweeter name and an apt name to dear ones. Goidanich did the same. In 1947 he claimed the elusive lady should be renamed *Macrophoma phaseolina* (Tassi) Goid. (Although I prefer to follow, but the rules of nomenclature are such that one has to accept Goidanich's proposal). So currently the lady in her sclerotial attire she is *Rhizoctonia bataticola* (Taub) Butler.

Hensen and Valleau opposed the name *R. bataticola* (Taub) Butler on the ground that *Rhizoctonia* having the identity mark of clamp connections linked many of them to one or other Basidiomycetes; but *R. bataticola* (Taub) Butler, which has a pycnidial phase has no clamp connections and should be known by the former name *Sclerotium bataticola* Taub. But there is again confusion; for, *Sclerotium rolfsii* Sacc has been found to have its Basidiomycetous identity in *Pellicularia*. To my mind both *Rhizoctonia* and *Sclerotium* are heterogeneous assemblages of marauders whose sex life is not yet known.

In 1944 I first met the lady *phaseolina* in the lateritic soils of Dacca (Dhaka) farm where she relentlessly attacked jute right from seedling stage till harvest. My official duty was to chase her and find out means to stop her forays.

In pursuit of assigned duties an emotional attachment developed and one of my objective became unravelling the secrets of sex life of madam *phaseolina*.

Since *R. bataticola* (Taub) Butler the sclerotial disguise of *M. phaseolina* (Tassi) Goid has no clamp connection, I expected an Ascomycetous member would be the answer. On 31st August, 1961, I found some apothecia clinging fast on basal part of stem of some jute (*C. capsularis*) plants.

The plants were around sixty days, growing in the gamma garden (of Jute Agricultural Research Institute) with a cobalt 60 source.

Monosporous culture from ascospores produced mycelia resembling that of *M. phaseolina* and on P.D.A. produced charcoal black sclerotia somewhat larger (160μ — 275μ) than *R. bataticola*. The mode of development of sclerotia matched that of *R. bataticola* but were less compact and larger.

The mycelia and sclerotia from the ascospores used as inoculum failed to infect jute or produce pycnidia. This dashed my hopes but we knew we are nearer to the unravelling of the secret.

We believe a thorough search amongst Ascomycetes in the jute belt of Indo-Bangla region will one day be rewarded and the secret sex-life of Madam *phaseolina* would be found.

The apothecia—whose ascospores—germinated and produced black sclerotia—was named *Orbilia obscura*—which of course may or may not be a cousin of *phaseolina*. Are we not packing all black, compact sclerotia in one box *R. bataticola*.

Her activities : seduction of jute in particular

In order to control depridation of jute by *phaseolina* it is necessary to understand her modus operandi—her strength and weaknesses. Reichert and Hellinger stated that she was found fleecing 231 hosts, that was upto 1947. More victims must have been listed by now. She does not have transportable toxins like lycoramasmin or vasofuscarin. She enters host tissue by necrotrophic action, involving pectinase.

Page and Bodman concluded well ; they said that when soil physical properties are unfavourable, availability of nutrients are reduced either by restricting root extension or by adversely affecting chemistry of soil, only the *phaseolina* acts. They further added that depletion of soil pore-space impedes potassium uptake which leads to a condition in the host when it succumbs to *phaseolina*. The speaker too found in 1957 that every jute plant (JRC 212) was suffering from stem rot in a lateritic clay in Burdwan ; the pore-space was impeded, plants were thin and shunted. Again, in the same field there were patches of porous soil formed in situ by pulling down ant hills ; jute plants growing there were tall and disease-free. Mandol and others stated that when NPK balance is disturbed specially when potash is unavailable *phaseolina* finds it easy to attack jute.

Persons in pursuit of *R. bataticola* or *M. phaseolina* attacking one or other victims like cotton, jute, field beans, kerai etc found as following factors favouring *phaseolina*'s attack

- i) High soil temperature (37%) with soil moisture above 12%
- ii) Dry soil (moisture below 12%), high air temperature (34°C)
- iii) Low C/N ratio in host
- iv) Low K_2O/CaO ratio in host
- v) Lack of availability of potash
- vi) Depletion of pore-space in soil
- vii) Genetic susceptibility

Immunity in any of the hosts has been unknown. Considering all facts, I found, chemotherapy (seed treatment excepted) is redundant so far *phaseolina* on jute is concerned. I lay emphasis on agronomy particularly soil management and balanced nutrition ; besides building genetic resistance in hosts. In jute sturdy high yielding varieties have combined fairly good resistance to pycnospor

attacks ; they are JRO 632 ; JRO 7835, JRO 524 ; JRO 3690, JRC 321, JRC 212, D154, JRC 7447 & JRC 1108.

Recommendations to avoid or fight *phaseolina* and *R. bataticola* are as under :

- a. Treat the seed if raised in humid climate of the traditional jute belt to eliminate sclerotia-hyphate complex.
- b. Avoid heavy clay or lateritic clay ; confine jute to loam, clay-loam or sandy loam of pH value 6.0 to 7.0.
- c. Incorporate dolomite if soil pH is between 5.8 and 6.2.
- d. Incorporate organic manure in soil to stabilize water retention capacity.
- e. Apply potash fertilizer and phosphate fertilizer if availability is poor. Don't apply N-fertilizer in quantities in excess of requirement.
- f. Thin out jute seedlings to adequate number.
- g. Remove within 35 days crop age. stubbles by raking and do not grow jute in the same field more than three years in succession.
- h. Ensure adequate drainage where possible.

You have denied *phaseolina* and *bataticola* opportunity to attack your friends.

Macrophomina phaseolina in Hoogly Belt

In the jute—potato belt centering Hooghly district, Madam *phaseolina* has ganged up with internationally known bandits, *Fusarium solani* and *Pseudomonas solanacearum* creating havoc in the *olitorius* tribal population. In this jute-potato belt she does not work alone. The devastation called for a new name and I named it Hoogly wilt to distinguish it from root-rot caused by *phaseolina* alone.

Investigations revealed that initially *phaseolina* burgles into jute roots. Next, through the broken doors enter the two accomplices—*Pseudomonas* and *Fusarium* ; they drug jute with toxin and chokes the vessels and within a week the entire jute population turn corpse , the field become black with deadbody.

Further alarming evidences are pouring-in, to confirm that *Pseudomonas* can act independently.

In the jute-potato cropping sequence *phaseolina* hides in jute stubbles, while the other two thrives in tubers and post-harvest debris of potato plant. Thus the trio have a free hand and create havoc.

Policing requires lot of money, and arresting the culprits and sending them to gallows require a money-consuming hunt, which is not forth coming. Hence the easier way the pathologists found is to avoid the thugs and deny them quarter in jute-potato field. How does one do it ?

The ways are :

- (i) Stop cultivating jute for two consecutive years and grow paddy or vegetables of short duration class.
- (ii) Don't incorporate rotten potato tubers in the fields; they don't make manure.
- (iii) Make the field free from crop debris as far as possible.
- (iv) Insulate the soil by repeated ploughing.
- (v) Ensure good drainage.

Chemotherapy ?—No ! Up till now it has not worked.

The Relentless Lady

Madam phaseolina is adept in recruiting new friends and accomplices in the underworld. The Mycological investigating Bureau has obtained recent evidences that she has chummed up with an alien criminal *Meloidogyne incognita* belonging to the felonious criminal gang of *Nematodes*. The latter forces entry into the roots of older jute; *phaseolina* follows and inexorably destroys poor jute. This alarming situation is reported from districts of 24-Parganas (N), Nadia, Jalpaiguri and Cooch Bihar.

I have observed that where jute is followed by paddy, Phaseolina—*Meloidogyne* combine does not work. Their activity is restricted to fields where jute—vegetable rotation (particularly with brinjal, tomato and chilli) is in vogue.

Again good agronomical measure can stop the scourge by altering cropping sequence, judicious water-use and of-course with limited use of nematocides.

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