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**The Problem of "Internal Spotting" of yams *Dioscorea* Sp.
in Barbados — W. de Courcey Jeffers and Wynter Headley**

Introduction:

Yams have been traditionally grown in Barbados for some time. Planting is carried out in May and June and harvesting of the crop commences in December and continues until about February.

The yams grown in Barbados are cultivars of the species *Dioscorea alata*. The bulk of the plants are of the cultivar "White Lisbon" or "Crop Lisbon" while other cultivars include "Oriental", "Coconut Lisbon", "Bottleneck Lisbon" and "Hunte"(2).

Within recent years yams have assumed somewhat greater importance in the economy of Barbados as a crop, particularly with the advent of a developing export trade with Britain. In 1965 for instance, the value of yams exported to Britain from January to June was valued at approximately £40,000 and this was in a year when considerable losses from rotting occurred and when prices were generally low.

Generally, yams are shipped from Barbados from December to June. Rotting in shipped yams was first observed on 6th May 1965 soon after arrival in Britain(3). Following shipments showed up to fifty percent wastage in that year, resulting in low prices.

The problem of "Internal Spotting" was evident prior to 1965 but it assumed greater importance since it posed a threat to the developing export trade. Several specialists were enlisted from time to time to assist with the identification of the organism or organisms responsible for this condition of "Internal Spotting".

Description of the Problem:

Iton(4) in 1964 described the condition as follows:

"Planters on several holdings reported a rot in the tubers. Specimens of cut tubers were seen to have an irregular more or less extensive, internal rusty brown discoloration which often appeared to have little or no connection with the surface of the tuber. The rot is sometimes detected at harvest time but as the tubers are seldom cut before cooking time the condition is more commonly observed then. The impression that this condition develops during storage may therefore be erroneous as its earlier history is inaccurately known." Iton referred to the condition as "Internal Brown Rot".

The following year (1965) J. T. Mills a plant pathologist of Tate & Lyle, Trinidad visited Barbados to further investigate the yam problem. After examining yam tubers at Pool Plantation, St. John, he described the condition as follows:

"A few yams when cut were found to have isolated brown-black spots within the tubers. In the early stages, the spots were hard and nut like, similar to the stone cells of a pear, but larger and darker. Later the spots enlarged and became softer."(5) He referred to the conditions as "Internal Spotting" and the condition has been known as this ever since.

Identifying the Problem:

Iton⁽⁴⁾ was unable to identify the problem. Preserved specimens from Barbados were examined microscopically at St. Augustine, but according to Iton „the disease is still obscure. Mycelium and nematodes are absent, but there is an indistinct granular appearance within the yam tissues.” Mills ⁽⁵⁾ found no fungi, bacteria or nematodes that could have resulted in 'internal spotting'. He did mention however that "Internal Spotting is similar to a virus disease 'internal cork' of sweet potato (Walker, 1952). However, no virus disease has been reported in yams and it was not possible to check the foliage for virus symptoms as the new crop had only recently been planted."

He went on to state "The symptoms of "Internal Spotting" are very similar to Boron deficiency disease in sugar beet (Walker, 1952). This disease is very common in limestone soils. Commonly, symptoms appear one year but not in that following, when the beet crop is grown on the same field. Weather conditions influence the disease. In general, boron deficiency disease appears more often in dry summers or particularly when a long dry spell is followed by a wet period favouring rapid growth. Varieties differ in their reaction to boron deficiency in the soil."

Edmunds 1966⁽⁴⁾ a nematologist with the Regional Research Centre, St. Augustine, carried out a similar assignment in Barbados. He wrote "The 'Internal Spotting' and rotting of yams grown in Barbados is not directly caused by nematodes for the following reasons:

(a) no nematodes were present in the skins or internal tissues of yams in various stages of rot,

(b) the soil samples contained a low nematode population and it is unlikely that the nematodes extracted from the soil (mostly saprophytic) would cause 'Internal Spotting',

(c) the symptoms of 'Internal Spotting' are not in any way comparable to the reports on nematode damage to yams."

It appears clear therefore that the organism or organisms causing 'Internal Spotting' of yams were not positively identified. The various specialists however made recommendation for the Ministry of Agriculture to follow, in an attempt to identify the problem.

Recommendations:

Iton⁽⁴⁾ stated "It is possible that this condition is infectious and it is advisable to practise good sanitation to prevent its spread. Whenever tubers are recognized as being diseased they should be removed from the harvest or from the store and burned. It is not advisable simply to discard such tubers by putting in a compost heap or to feed them to livestock. This might merely serve to disseminate the infective agent. It is clear also that such tubers should not be used as planting material.

It is also desirable that further field observations be made with a view to discovering the cause of this condition. For example, a close

and frequent examination of the foliage during growth might reveal transient symptoms indicating virus infection."

Mills⁽⁹⁾ recommended the following research:

1. Fertilizer — variety trials on various soil types to determine:—
 - a. The susceptibility to disease of each variety.
 - b. The effect of fertilizer regime on the prevalence of the disease.
 - c. The effect of fertilizer on the keeping qualities.
2. Analysis of soil fields from which diseased tubers have been obtained.
3. "Internal Spotting". A series of trials with White Lisbon on various soil types to test the effect of applying micronutrients particularly boron (as borax), at rates of 15, 20, 25 lb to the acre, applied with the usual fertilizers. Also try spraying the foliage with a solution of borax at a rate (say) of 5, 10 and 15 lb. to the acre.
4. Observe foliage of yams for virus symptoms.
5. Experiments with different storage temperatures on board ships. Recording of temperature and relative humidity data in the holds and an attempt to relate the data to the amount of rotting produced.

Among Edmonds'⁽¹⁾ recommendations were:—

- (1) Make an extensive survey of the plantations with disease and disease free material and gather information on the cultural practices, storage conditions as well as characteristics of the areas sampled.
- (2) The Ministry of Agriculture should purchase disease free "seed" from areas found to be free of "Internal Spotting" and set up regional trials in areas known to produce the disease situation. Seed from areas known to have the disease should be similarly planted in regional trials. Such an experiment would give further information on the nature and cause of the disease.

Investigations Undertaken by the Ministry of Agriculture, Barbados.

YAM SURVEY⁽³⁾. During 1966 a survey of some sixty-three plantations including all soil types known to produce yams was undertaken by Messrs. Taylor and Headley. The classification was based on selecting ten yam tubers at random and sectioning them, and scoring on the following basis:

Classification: Range 0 in 10 Free
 ,, 1—3 in 10 low
 ,, 4—6 in 10 Moderate
 ,, 7 in 10 High.

The results of this survey were as follows:

1. Only the cultivar „White Lisbon" or Crop Lisbon appeared to be affected by "Internal Spotting".
2. Where "Internal Spotting" was found in a field, it did not appear to be localized.
3. "Internal Spotting" was found on all soil types.
4. Some Plantations were found to be free of "Internal Spotting".
5. One planter reported seeing this condition in yams some thirty-eight years ago.
6. Of the sixty-three plantations visited in the Survey, the incidence of "Internal Spotting" on a percentage basis was as follows:

Percentage	Incidence
17.46%	Free
44.45%	Low
20.63%	Moderate
17.46%	High

Storage Trials:

Headley(*) reports that "storage trials were initiated in 1966 to determine the spread of "Internal Spotting" of yams under conditions similar to those obtaining during shipment to the U.K. as against normal Plantation storage conditions."

Infected and non infected or 'Free' yams were stored at the Barbados Marketing Corporation at temperatures of 60°F.—65°F., while similar material was stored at the Ministry of Agriculture under ordinary storage. After seven months of storage the results were not conclusive.

Field Trials:

Some thirteen plantations were selected, based on the previous classification to include all categories for a field trial. Clean material was bought from 'Cleland Plantation' for use in these trials. One half of each trial area received twenty-five tons per acre of farmyard manure three weeks after germination, while the other half received two cwts. of Sulphate of Ammonia plus two cwts. of Muriate of Potash per acre. In addition, boron (as borax) was applied at the rates of 15, 20, and 25 lb. per acre (Mills*) Additional areas planted by the plantations and adjoining the experimental sites were similarly treated.

Complete results were obtained from eight sites and partial results from one site. The other four sites had to be discarded because of interference.

Results from these trials indicated that boron is not a contributing factor in "Internal Spotting" of yams. These trials further indicated that the use of clean planting material (free from "Internal Spotting") is likely to give rise to 'clean' production.

Table I

FARMYARD MANURE APPLIED: 25 tons per acre.
BORON APPLIED.....: 1, 20, 25 lbs. per acre.

FERTILIZERS APPLIED: 2 cwt.s. N—2 cwt.s. K per acre
BORON APPLIED : 15, 20, 25 lbs. per acre.

Sites	Soil Type	Number of Yams Spot- ting	Number of Suspect Yams	Number of Free Yams	Yields in tons per acre	Number of Yams Spot- ting	Number of Suspect Yams	Number of Free Yams	Yields in tons per acre
PLANTATION MATERIAL.									
Wotton	30	6	Nil	9	2.99	4	Nil	11	2.08
Pool	50	5	1	9	9.97	8	Nil	7	6.70
Clifton Hall	65	6	Nil	9	8.17	6	Nil	9	4.64
Francia	50	Nil	4	11	7.90	1	Nil	14	6.38
Lancaster	40x	4	1	10	5.78	6	Nil	9	5.51
Warleigh	40x	3	2	10	6.66	5	Nil	10	3.02
Parks	150	2	Nil	13	4.00	Nil	Nil	15	3.43
Maynards	Red Sands	3	Nil	12	4.78	1	4	10	3.64
Nicolas	60	4	Nil	11	Nil	9	Nil	6	Nil
CLEAN MATERIAL.									
Wotton	30	Nil	Nil	15	5.20	Nil	Nil	15	5.72
Pool	50	Nil	Nil	15	5.82	Nil	Nil	15	7.02
Clifton Hall	65	Nil	Nil	15	4.94	Nil	Nil	15	4.05
Francia	50	Nil	2	13	8.84	Nil	Nil	15	6.03
Lancaster	40x	1	Nil	14	10.45	Nil	Nil	15	9.05
Warleigh	40x	Nil	Nil	15	10.36	Nil	Nil	15	5.67
Parks	150	Nil	Nil	15	5.15	1	2	12	4.47
Maynards	Red Sands	Nil	2	13	5.93	1	1	13	5.30
Nicolas	60	Nil	Nil	15	Nil	Nil	4	11	Nil

During early 1967, samples of yams from Barbados were air freighted to the Tropical Products Institute in Britain where work is continuing in an attempt specifically identify the cause or causes of "Internal Spotting". To date a specific identification has not been made, but indications are that the condition is likely to be caused by Virus.

SUMMARY:

Yams have been traditionally grown in Barbados for several years. More recently, with the advent of an export outlet to Britain — (which is likely to expand somewhat) yam production has assumed a more prominent role in the economy of Barbados. (Exports in 1965 accounting for approximately £40,000).

In 1965 the incidence of „Internal Spotting" of yam tubers exported to Britain caused great concern, so much so that the assistance of various specialists had to be solicited. One planter has however indicated that the condition now referred to as "Internal Spotting" was noticed in Barbados as far back as thirty-eight years ago.

Despite the valuable assistance obtained from visiting specialists and work by the Ministry of Agriculture, the factors causing or contributing to the condition of "Internal Spotting" of yams have not been specially identified.

Recent Field trials carried out by the Ministry of Agriculture indicate that Boron is not a contributing factor of the problem of "Internal Spotting", while the use of clean planting material free from 'spots' is likely to give rise to a clean production.

Earlier workers (Iton, Mills, Edmunds) have all indicated that Virus may well be the causal organism. More recently the Tropical Products Institute, England have voiced the same opinion.

REFERENCES CITED

1. Report on a visit to Barbados to Investigate the Role of Nematodes in the rotting of yams—
by J. E. Edmunds, Nematologist, Regional Research Centre.
2. West Indian *Dioscorea alata* cultivars—Tropical Agriculture.
Trin., 37: pp. 11—30 by H. J. Gooding (1960)
3. Internal Spotting of yams 1966—67, Ministry of Agriculture, Barbados
by Wynter Headley.
4. Report on a visit to Barbados to investigate Diseases of yams and
other crops—
by E. F. Iton, Plant Pathologist, Regional Research Centre.
5. Report on a visit to Barbados to investigate Diseases of yam tubers
by J. T. Mills, Plant Pathologist, Tate & Lyle, Central Agricultural
Research Station, Trinidad.