

## Chapter 4

### Incidence of diseases and pests in sweet potato fields

#### 4.1 Introduction

Sweet potato, like other crops is prone to pest and diseases, which affect its production. The incidence of pest and diseases on sweet potatoes is not largely known in South Africa. The first survey was conducted in Kwazulu Natal and Mpumalanga provinces of South Africa in 1996/1997 (van der Mescht *et al.*, 1997; Thompson *et al.*, 1999). Based on field observation judgements, insect damage was the most common problem of sweet potatoes. Sweet potato weevils, stem borers and beetles are important insects of sweet potatoes (Ames *et al.*, 1997). Aphids and whiteflies as virus vectors (Brunt *et al.*, 1996) were also reported to lower the production of sweet potatoes by reducing the yield of the crop.

It was also observed that infected sweet potatoes rarely express virus symptoms in the field and when present, symptoms are seen on older leaves (van der Mescht *et al.*, 1997; Thompson *et al.*, 1999). The current survey is a continuation of the previous one because only few provinces were covered during that survey.

The main objectives of the study was to establish the incidence of pests and diseases in different provinces and to observe the prevalent sweet potato virus symptoms found in each province. However, not all nine provinces were covered in this current survey due to the fact that sweet potato is not a common crop in some provinces and that access to areas can only be gained through extension worker and community members and getting such cooperation was sometimes a problem. In these two surveys, the incidence and importance of pests and diseases was found to vary from region to region. It is important to establish the distribution and relative importance of these pests and diseases in order to orientate research priorities and develop control strategies.

## 4.2 Materials and methods

A survey of pests and diseases in sweet potato fields was carried out in seven provinces of South Africa (Limpopo, Mpumalanga, Gauteng, Western Cape, Eastern Cape, Kwazulu Natal and North West). All fields were surveyed on a W-pattern method of sampling. Thirteen sampling points were selected at random along this pattern in each field. The plants were rated for leaf spots or blights, stem spots or blights, virus symptoms, insect damage, root rot and wilts.

Diseases ratings were as follows:

- 0 - Disease/pest free
- 0.1 - 0.5 - Plants slightly affected or infected
- 1 - Approximately 1/5 of plants affected
- 2 - Approximately 2/5 of plants affected
- 3 - Approximately 3/5 of plants affected
- 4 - Approximately 4/5 of plants affected
- 5 - Whole plant affected/ all plants infected

Samples representing different cultivars found in each farm were collected at every sampling point. Collected vines were brought to ARC-Roodeplaat where they were grown in pots of 15 and 18cm diameter, using pasteurised media (Just Nature, South Africa). Planted cuttings were maintained in a glasshouse at temperatures of 20-30°C. Plants were given a supplementary feeding containing 19.0% nitrogen, 8.2% phosphorus, 15% potassium, 350ppm zinc, 1000ppm boron, 70ppm molybdenum, 750ppm iron, 300ppm manganese, 75ppm copper and 900ppm magnesium (Multifeed P, Plaasskem, Pty, LTD) on a weekly basis. Plants were also monitored for insect pests and sprayed with chemicals as required.

## 4.3 Analysis

The data was entered in an EXCEL spreadsheet program and the statistical averages of the Provinces and of the whole country was calculated.

## 4.4 Results

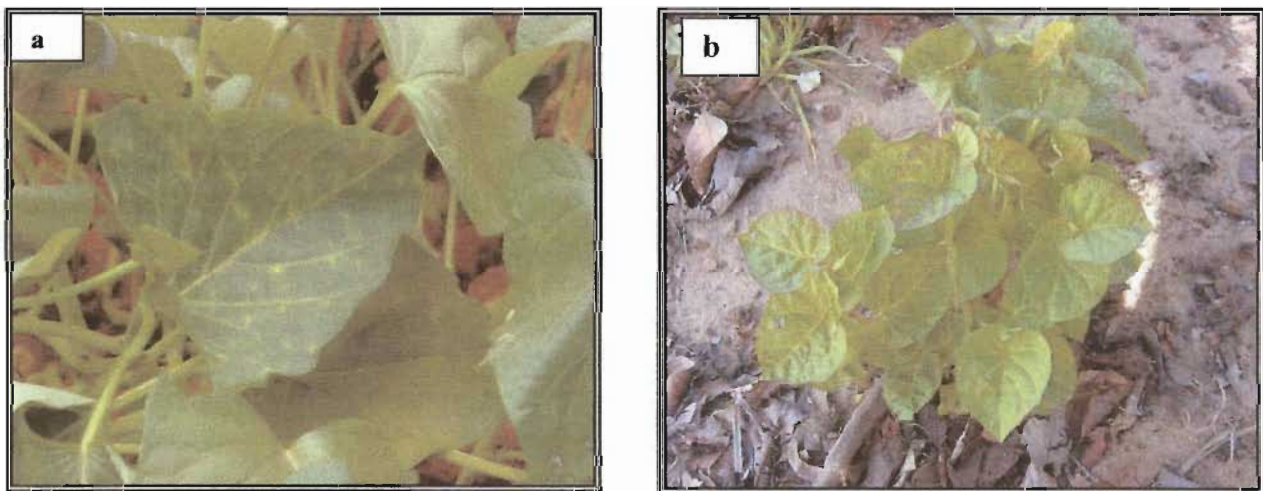
As in 1996/1997, the prevalence of diseases and pests varied between provinces and due to climatic factors. The results for severity ratings for pests and diseases incidences assessed during the survey are given in Appendix 4.1 and a summary is given in Table 4.1. Although some leafspots and blights were observed on sweet potato leaves in the fields in some provinces, the average incidence for leafspots for the country was very low (0.2). Stemspots and blights, root rot and wilt were not observed on sweet potatoes in all areas surveyed. Although not prevalent, virus symptoms were observed during field surveys (Figure 4.1) but not in all areas of the provinces visited. The average virus incidence was 0.3 (less than one) for the country. Although it had the small average of 0.5 (less than one), Mpumalanga was the only province that had the highest number of plants with conspicuous symptom expression. The most prevalent symptoms were vein clearing, crinkling, chlorotic spots, and purple ring spots on older leaves in areas such as Beverbreed and Hazyview. Suspected symptoms of sweet potato virus diseases (SPVD) such as severe vein clearing, leaf distortion, chlorosis, mosaic and stunting were also observed in Hazyview (Ntsikadzi) and Gutjwa. Typical sweet potato feathery mottle virus symptoms such as vein clearing, purple ring spots and chlorotic spots were also observed in the Western Cape (Goedverwacht and Ebenezer). In the Eastern Cape, the incidence of virus symptoms was also very low, with the average of 0.1. Virus symptoms were rarely observed in the Limpopo, Gauteng and Kwazulu Natal provinces. Symptoms such as vein clearing were also observed on wild *Ipomoea* species such as *Ipomoea sinensis* (Ders.) Choisy (identified by National Botanical Institute of South Africa), which were found to be growing with sweet potatoes in the Mpumalanga and Western Cape province. The overall average virus disease incidence of 0.3 for the whole country showed that affected sweet potatoes did not readily express virus symptoms.

Insect damage on leaves was the major problem in all areas of the provinces visited. The overall average incidence for insect damage for the provinces surveyed was 1.4. Gauteng and Kwazulu Natal provinces had the highest insect damage incidences average of 3.8 and 3.5 respectively compared to other provinces. Although leaf damage was of lesser important to farmers, it was indicated that the most problematic insect pests to their production were weevils and caterpillars that fed on leaves. Weevils were

also mentioned to lower the production of sweet potato by eating holes in exposed tubers. Sweet potato virus transmitters such as whiteflies (on sweet potatoes) (Figure 4.2) and aphids (on weeds) were also observed in some fields in the Mpumalanga and Western Cape provinces.

**Table 4.1 A summary of the average incidence of pests and diseases of sweet potato for the provinces and the country**

Ratings	Provinces							Country
	E. Cape	W. Cape	MP	Gauteng	KZN	N. West	L.P	
Leaf spots and blights	0.2	0.6	0	0.5	0.5	0	0.03	0.2
Stem spots and blights	0	0	0	0	0	0	0	0
Virus diseases	0.1	0.2	0.5	0.4	0	0.2	0.01	0.3
Insects damage	2.2	2.1	0.6	3.8	3.5	2	0.9	1.4
Root rot	0	0	0	0	0	0	0	0
Wilts	0	0	0	0	0	0	0	0



**Figure 4.1 Sweet potato plants/leaves showing (a) chlorotic spots on older leaves and (b) vein clearing and stunting symptoms in the fields**



**Figure 4.2 Whiteflies on sweet potato leaf during field survey in the Western Cape province**

#### **4.5 Discussion and conclusion**

During the 1996/1997 survey, leaf spots were found to be more prevalent than stem spots and the incidence was found to be less than 10% (van der Mescht *et al.*, 1997; Thompson *et al.*, 1999). Fungal organisms were also diagnosed from samples tested (van der Mescht *et al.*, 1997; Thompson *et al.*, 1999). It was also found during the current survey that leaf spots and blights, stems spots and blights, roots rots and wilt are not as important to sweet potato production as virus diseases and insect damage. Although their effect on sweet potato production is not as high as that of virus diseases, leaf spots and blights, stems spots and blights, roots rots and wilt also need to be controlled to prevent them from becoming threats to production in future.

Insects damage on leaves was also found to be prevalent during the 2001/2003 survey and the 1996/1997 (van der Mescht *et al.*, 1997) survey. Insects such as cutworms,

millipedes, sweet potato weevils, bollworms and in some areas locusts were mentioned to be problematic by some farmers who had been interviewed. However, most farmers did not consider leaf damage by insects a limiting factor to their production because only few farmers indicated that they were controlling (apply chemicals) insects pests on sweet potato crops. It should be brought to the government's attention that, affordable control measures need to be researched and made accessible to both small-scale and medium scale farmers in order to enhance pests control all over the country.

Sweet potato virus symptoms are rarely seen in the field in most areas in South Africa. This is due to the fact that the prevalence of diseases (or insect damage) is greatly influenced by weather conditions. It can also be speculated that the local varieties have some tolerant genes that enhance the suppression of symptoms under field conditions. Aphids and whiteflies have been reported to spread sweet potato virus diseases such as sweet potato feathery mottle virus (SPFMV), sweet potato mild mottle virus (SPMMV) and sweet potato chlorotic stunt virus (SPCSV) (Moyer and Salazar, 1989; Gibson *et al.*, 1998). The presence of aphids and whiteflies in some areas in the provinces is an indication that high levels of viruses could be found within the plants and that the spread of the most important viruses in South Africa such as SPFMV and SPMMV (Jericho and Thompson, 2000) could increase with time.

In Chapter 3 of this thesis, it was indicated that farmers did not know what aphids and whiteflies were nor their effect on sweet potato production. The vegetative propagation of sweet potato and sharing planting materials among farmers will result in the uncontrollably spread of sweet potato viruses. The non-persistent modes of transmission of SPFMV by aphids (Moyer and Salazar, 1989) also make control impossible. During the baseline survey (Chapter 3, this thesis), farmers also indicated that disease and pests control measures are rarely practised. Farmers need to be taught about the use of virus free planting materials and how to select them, not only to prevent the spread of viruses, but also to produce high yielding crops with good quality. However the low incidence of virus symptoms in the field makes the selection of virus free material difficult. It should be considered that the incidence and severity of diseases and pests during all surveys (1996/1997 and 2001/2003) only covered seven provinces and that surveys were conducted at a certain period of time. The effect of pests and viruses within the country could still be underestimated and the results might not be a true reflection of the

real incidence of pests and diseases in the country. The true reflection can only be obtained if extensive research on incidences of diseases or pests can be conducted in all seasons, since the prevalence is influenced by weather conditions.

## 4.6 References

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