

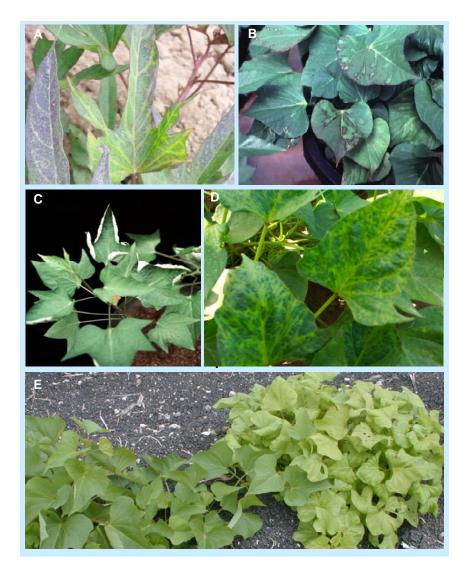


## **Sweetpotato virus indexing**

Segundo Fuentes

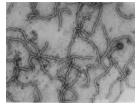


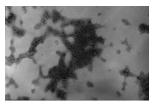
## Viruses affecting sweetpotato











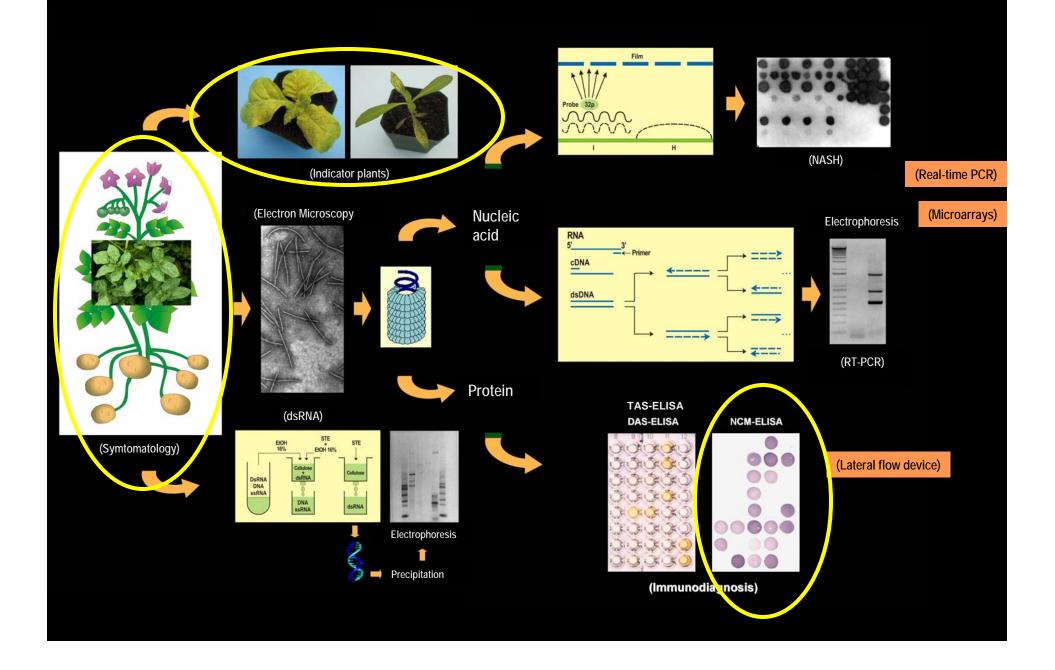
> 20 viruses

2

## **Recognized viruses that infect sweetpotato**

| Genus        | Virus  | Transmission | Distribution   |
|--------------|--------|--------------|--|
| Potyvirus (  | SPFMV  | Aphid        | Worldwide  |
| ·            | SPLV   | Aphid        | Taiwan, China, Japan, Indonesia, Philippines, India, Egypt   |
|              | SPMSV  | Aphid        | Argentina, Peru, Indonesia, Philippines, China, Egypt, South Africa, Nigeria, New Zealand            |
|              | SPVG   | Aphid        | China, Japan, USA, Egypt, Ethiopia, Nigeria, Barbados, Peru, Spain, South Africa                     |
|              | SPV2   | Aphid        | USA, Taiwan, China, South Africa, Portugal, Australia, Barbados                                      |
|              | SPCSV? | Unknown      | Caribbean Region, Zimbabwe, Uganda, Kenya  |
|              | SPVMV  | Aphid        | Argentina  |
| Ipomovirus < | SPMMV  | Whitefly?    | Africa, Indonesia, China, PNG, India, Egypt, New Zealand   |
|              | SPYDV  | Whitefly     | Taiwan, Far East   |
| Crinivirus < | SPCSV  | Whitefly     | Worldwide  |
| Cucumovirus  | CMV    | Aphid        | Israel, Egypt, Kenya, South Africa, Japan, New Zealand   |
| Begomovirus  | SPLCV  | Whitefly     | Far East, USA, China, Taiwan, Japan, Korea, Europe, Africa?, Peru                                    |
|              | SPLCGV | Whitefly     | USA, Puerto Rico   |
|              | IYVV   | Whitefly     | Spain, Italy   |
|              | ICLCV  | Whitefly     | Israel   |
| Carlavirus C | SPCFV  | Unknown      | Africa, China, Taiwan, North Korea, Cuba, Panama, South Americaa, N. Zealand                         |
|              | C-6?   | Unknown      | USA, Peru, Cuba, Dom. Rep., Indonesia, Philippines, P. Rico, Egypt, Kenya, South Africa, New Zealand |
| Nepovirus    | SPRSV  | Unknown      | Papua New Guinea, Kenya?   |
| Caulimovirus | SPCaLV | Unknown      | South Pacific Region, Madeira, China, Egypt, P. Rico, Nigeria, Kenya?                                |
| llarvirus    | TSV    | Unknown      | Guatemala  |
| Polerovirus  | SPLSV  | Aphid        | Peru, Cuba   |
| Tobamovirus  | TMV    | None         | USA  |
| Unknown      | C-3    | Unknown      | Brazil. Unknown in others countries  |
|              | C-9    | Unknown      | ?  |

## Virus detection methods



# Serological test

### **NCM-ELISA** test





**NCM-ELISA** kit



## Ipomoea setosa (universal indicator plant)





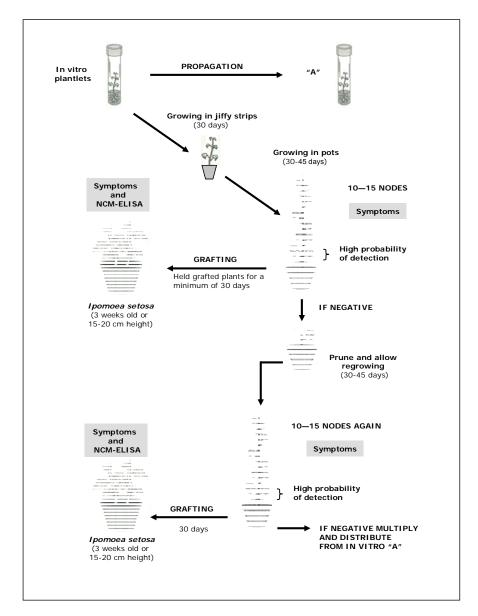


## Transmission of plant viruses

- I. Mechanical and by contact
- II. Grafting (universal method for transmitting viruses) Sweetpotato
- III. Vectors
  Insects (aphids, whiteflies)
- IV. Pollen and sexual seed



# Indexing procedure for sweetpotato viruses



NCM-ELISA is performed for 10 viruses (SPFMV, SPLV, SPVG, SPMSV, SPMMV, SPCSV, SPCFV, C-6, SPCaLV, and CMV).



## **Growing plantlets in a greenhouse**













## **Ipomoea setosa** (universal indicator plant for viruses that infect sweetpotato)







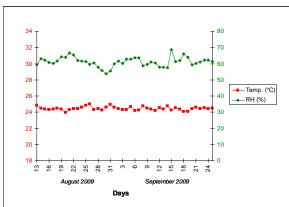
## Wedge-grafting to *Ipomoea setosa*





## **Recording symptoms**

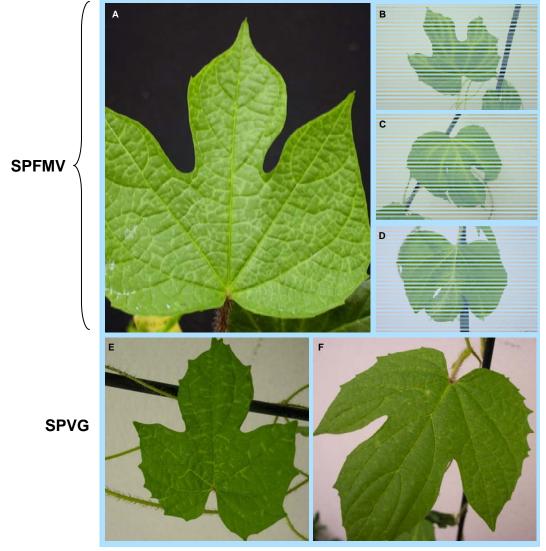






## Symptoms 1: vein clearing

## (Potyvirus)







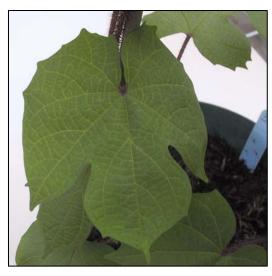
Unknown (Negative in NCM-ELISA)

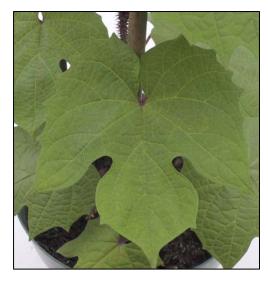
13



## **Symptoms 2: chlorotic points**

## (Carlavirus)











## Symptoms 3: vein clearing / blistering







## Symptoms 4: vein necrosis/ necrotic points or spots

## (Cavemovirus)















# Symptoms 5: chlorosis/ interveinal chlorosis / leaf curling

(Begomovirus)

















## **CIP 400025 (Lovers Name)**

Saint Vincent & Grenadines)







**CIP 440379 (Dilaw)** 

Philippines









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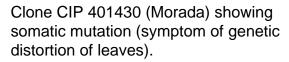
## Final Results of Virus Indexing (Group 25, 2009)

| 2            | ı            |        |                          |                    |                      |                               |                  |                   |                    |        |                     |                 |
|--------------|--------------|--------|--------------------------|--------------------|----------------------|-------------------------------|------------------|-------------------|--------------------|--------|---------------------|-----------------|
|              |              |        |                          |                    |                      |                               |                  |                   |                    |        |                     |                 |
| 3            | Danasal      |        | Accession                | Labasala           | Collecting<br>number | A                             | CD community man |                   | Caralami           | PCR    | Desults             | Observations    |
| 38           | Record<br>35 | code   | number<br>CIP 401066     | SG-1477            | GTM 392              | Accession name  Camote Morado | SP symptoms      | L setosa symptoms | Serology           | PCR    | Results<br>REJECTED | Observations    |
| 39           | 36           | 2      | CIP 401066               | SG-1524            | DLP 2888             | Morada                        |                  | VC, VII           |                    |        | APROVED             |                 |
| 40           | 37           | 2      | CIP 403380               | SG-1558            | INIVIT 9             | Blanco Especial               |                  |                   |                    |        | APROVED             |                 |
| 41           | 38           | 2      | CIP 402666               | SG-1588            | INIVIT1049           | Dianco Especial               |                  | RU,D,IVC          |                    | Begomo | REJECTED            |                 |
| 42           | 39           | 5      | CIP 402691               | SG-1592            | INIVIT1078           |                               |                  | C,RU              |                    | Begomo | REJECTED            |                 |
| 43           | 40           | 5      | CIP 402721               | SG-1604            | INIVIT1216           |                               |                  | RU                |                    | Begomo | REJECTED            |                 |
| 44           |              |        | CIP 401130               |                    |                      | Camote Morado                 |                  |                   |                    |        |                     |                 |
|              | 41           | 6      |                          | SG-1681            | GTM 1108             |                               |                  | IVC               |                    | Begomo | REJECTED            |                 |
| 45           | 42           | 7      | CIP 401375               | SG-1688            | SVG 27               | Six Weeks                     |                  | DJVC              |                    | Begomo | REJECTED            |                 |
| 46<br>47     | 43           | 4      | CIP 402619               | SG-1702            | INIVIT 217           |                               |                  | RU                | ope-ty             | Begomo | REJECTED            | opo-Lu/popy     |
| 48           | 44           | 3<br>5 | CIP 402655               | SG-1717            | INIVIT1038           |                               |                  | D,Ve,Vn,Ln        | SPCaLV             | D      | REJECTED            | SPCaLV (PCR)    |
| _            | 45           | 9      | CIP 402696               | SG-1731            | INIVIT1084           | 00.4007                       |                  | CIVC              |                    | Begomo | REJECTED            |                 |
| 49           | 46           | 1      | CIP 403435               | SG-1786            | CESDA861607          | 86-1607                       |                  | DD D II II I      | opo III            | -      | APROVED             | ur o avenes     |
| 50           | 47           | 5      | CIP 400789               | SG-1790            | CENDA 20             | Jacobina 5                    |                  | RD,D,Vc,Vn,Ln     | SPCaLV             | Begomo | REJECTED            | Virus C-9 (PCR) |
| 51           | 48           | 2      | CIP 401120               | SG-1816            | GTM 949              | Camote Blanco                 |                  |                   |                    |        | APROVED             |                 |
| 52<br>53     | 49           | 5      | CIP 401277               | SG-1827            | DLP 3898             | Rojo-kinit                    |                  | B.U.              | oper w opuo        |        | APROVED             |                 |
| 54           | 50           | 6      | CIP 420565<br>CIP 420163 | SG-1852<br>SG-1859 | DLP 66<br>DLP 123    | Espelma  Morado Morado        |                  | D,Ve              | SPFMV,SPVG         |        | APROVED             |                 |
| 55           | 51<br>52     | 2      | CIP 420183               | SG-1907            | DLP 887              | unknown                       |                  | Ср                | SPFMV,SPVG         |        | REJECTED            |                 |
| 56           | 52           | 6      | CIP 420181               | SG-1907<br>SG-1935 | DLP 1312             | Zapallona                     |                  | RD,Ve             | SPFMV,SPVG         | Posomo | REJECTED            |                 |
| 57           | 54           | 6      | CIP 420719<br>CIP 420291 | SG-2089            | DLP 3549             | unknown                       |                  | TID/YO            | or retrior var     | Begomo | APROVED             |                 |
| 58           | 55           | 5      | CIP 420231               | SG-2154            | ARB 323              | Camote Papa                   |                  | Ср                | SPFMV,SPVG         |        | REJECTED            |                 |
| 59           | 56           | 1      | CIP 420114               | SG-2156            | ARB 347              | Camote                        |                  | Op                | or i ivity, or var |        | APROVED             |                 |
| 60           | 57           | 6      | CIP 420488               | SG-2172            | ARB 425              | Espelma                       |                  |                   |                    | +      | APROVED             |                 |
| 61           | 58           | 3      | CIP 442115               | SG-2283            | IITA-CL 57           | mary and the                  |                  | C,RU,D            |                    | Begomo | REJECTED            |                 |
| 62           | 59           | 2      | CIP 443083               | SG-2384            | IITA-CL 249          | TIS 2180                      |                  | C,B               |                    | Begomo | REJECTED            |                 |
| 63           | 60           | 3      |                          | SG-2452            | IITA-CL 377          | TIS 8030                      |                  | -,-               |                    | Digomo | APROVED             |                 |
| l <b>4</b> · |              |        | 6-25 (Oct.               |                    | 1                    | 1.10.000                      |                  | <                 |                    | IIII   | IN NOVED            |                 |



## **Somatic mutation**



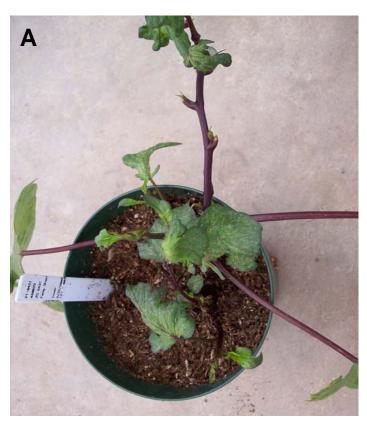


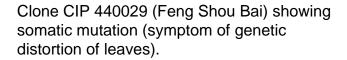


Indicator plant *I. seotsa* grafted with tissue scion from clone CIP 401430. No symptom is observed.



## **Somatic mutation**







Indicator plant *I. seotsa* grafted with tissue scion from clone CIP 440029. No symptom is observed.



## Final Results of Virus Indexing (Group 25, 2009)

| 38 39 3<br>39 3<br>40 3<br>41 3<br>42 3<br>43 4<br>44 4<br>46 4 |                      | code | Accession<br>number<br>CIP 401066<br>CIP 401448<br>CIP 403380 | <b>Labcode</b> SG-1477  SG-1524 | Collecting<br>number<br>GTM 392 | Accession name  | SP symptoms |                           |            |        |          |                 |
|---|----------------------|------|---|---------------------------------|---------------------------------|-----------------|-------------|---------------------------|------------|--------|----------|-----------------|
| 39 (340 (341 (342 (343 (444 (444 (444 (444 (444 (444            | 36<br>37<br>38<br>39 | 2 2  | CIP 401448  |                                 | GTM 392                         |                 |             | <i>l. setosa</i> symptoms | Serology   | PCR    | Results  | Observations    |
| 10 3<br>11 3<br>12 3<br>13 4<br>14 4<br>15 4                    | 37<br>38<br>39       | 2    |   | SG-1524                         |                                 | Camote Morado   |             | Ve,Vn                     |            |        | REJECTED |                 |
| 11 3<br>12 3<br>13 4<br>14 4<br>15 4                            | 38<br>39             | 2    | CIP 403380  |                                 | DLP 2888                        | Morada          |             |                           |            |        | APROVED  |                 |
| 12 3<br>13 4<br>14 4<br>15 4                                    | 39                   |      |   | SG-1558                         | INIVIT 9                        | Blanco Especial |             |                           |            |        | APROVED  |                 |
| 13 4<br>14 4<br>15 4<br>16 4                                    |                      | 5    | CIP 402666  | SG-1588                         | INIVIT1049                      |                 |             | RU,D,IVC                  |            | Begomo | REJECTED |                 |
| 14 4<br>15 4<br>16 4  | 40                   |      | CIP 402691  | SG-1592                         | INIVIT1078                      |                 |             | C,RU                      |            | Begomo | REJECTED |                 |
| 15 4<br>16 4  |                      | 5    | CIP 402721  | SG-1604                         | INIVIT1216                      |                 |             | RU                        |            | Begomo | REJECTED |                 |
| 16  | 41                   | 6    | CIP 401130  | SG-1681                         | GTM 1108                        | Camote Morado   |             | IVC                       |            | Begomo | REJECTED |                 |
| _   | 42                   | 7    | CIP 401375  | SG-1688                         | SVG 27                          | Six Weeks       |             | DJVC                      |            | Begomo | REJECTED |                 |
| 17  | 43                   | 4    | CIP 402619  | SG-1702                         | INIVIT 217                      |                 |             | RU                        |            | Begomo | REJECTED |                 |
| +/   "  | 44                   | 3    | CIP 402655  | SG-1717                         | INIVIT1038                      |                 |             | D,Ve,Vn,Ln                | SPCaLV     |        | REJECTED | SPCaLV (PCR)    |
| 18 4  | 45                   | 5    | CIP 402696  | SG-1731                         | INIVIT1084                      |                 |             | C,IVC                     |            | Begomo | REJECTED |                 |
| 19 4  | 46                   | 1    | CIP 403435  | SG-1786                         | CESDA861607                     | 86-1607         |             |                           |            |        | APROVED  |                 |
| 50 4  | 47                   | 5    | CIP 400789  | SG-1790                         | CENDA 20                        | Jacobina 5      |             | RD,D,Vc,Vn,Ln             | SPCaLV     | Begomo | REJECTED | Virus C-9 (PCR) |
| 51 4  | 48                   | 2    | CIP 401120  | SG-1816                         | GTM 949                         | Camote Blanco   |             |                           |            |        | APROVED  |                 |
| 52 4  | 49                   | 5    | CIP 401277  | SG-1827                         | DLP 3898                        | Rojo-kinit      |             |                           |            |        | APROVED  |                 |
| 53 :  | 50                   | 1    | CIP 420565  | SG-1852                         | DLP 66                          | Espelma         |             | D,Ve                      | SPFMV,SPVG |        | REJECTED |                 |
|   | 51                   | 6    | CIP 420163  | SG-1859                         | DLP 123                         | Morado Morado   |             |                           |            |        | APROVED  |                 |
|   | 52                   | 2    | CIP 420181  | SG-1907                         | DLP 887                         | unknown         |             | Ср                        | SPFMV,SPVG |        | REJECTED |                 |
| 56 :  | 53                   | 6    | CIP 420715  | SG-1935                         | DLP 1312                        | Zapallona       |             | RD,Vc                     | SPFMV,SPVG | Begomo | REJECTED |                 |
|   | 54                   | 6    | CIP 420291  | SG-2089                         | DLP 3549                        | unknown         |             |                           |            |        | APROVED  |                 |
|   | 55                   | 5    | CIP 420113  | SG-2154                         | ARB 323                         | Camote Papa     |             | Ср                        | SPFMV,SPVG |        | REJECTED |                 |
|   | 56                   | 1    | CIP 420114  | SG-2156                         | ARB 347                         | Camote          |             |                           |            |        | APROVED  |                 |
|   | 57                   | 6    | CIP 420488  | SG-2172                         | ARB 425                         | Espelma         |             |                           |            |        | APROVED  |                 |
|   | 58                   | 3    | CIP 442115  | SG-2283                         | IITA-CL 57                      |                 |             | C,RU,D                    |            | Begomo | REJECTED |                 |
| _   | 59                   | 2    | CIP 443083  | SG-2384                         | IITA-CL 249                     | TIS 2180        |             | C,B                       |            | Begomo | REJECTED |                 |
| 33   6<br>I <b>4 I</b>  |                      | 3    | CIP 442858  | SG-2452                         | IITA-CL 377                     | TIS 8030        | 1           |                           |            | 1      | APROVED  | I               |





# Virology Lab Info Management System (CIPVIR)

Maintenance ▶ Register a Diagnostic ▶ Distribution KITS ▶ Reports ▶ Tools ▶ Help



#### Welcome!

The 'Virology Lab Info Management System' proviservices that the 'Virology Section' of the 'Crop Proto the CIP staff and external clients.

The facilities are: Register the request of a diagramme, register the results of diagnostics, maint on pathogens, etc, print reports by differents crite

We welcome any comments and/or suggestions. RIU@cqiar.org

Virology Lab Info Management System version 1.0 (2003)+++Last software review: April, 2003+++Contact: CIP-RIU@cgiar.org



## Sweetpotato vs *Ipomoea setosa* vs serology



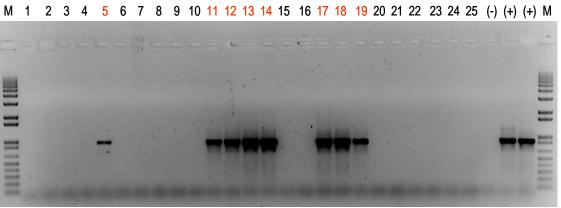
# NCM-ELISA

- Symptomless
- Low virus concentration



## Sweetpotato vs *Ipomoea setosa* vs PCR (begomovirus)







## Sweetpotato versus *I. setosa* versus serology



NCM-ELISA

- Symptomless
- Low virus concentration

**Indicator plant** 

+ Serology (ELISA)

Reliable detection of viruses



## External audit conducted by UKAS (C. Jeffries), October 2009



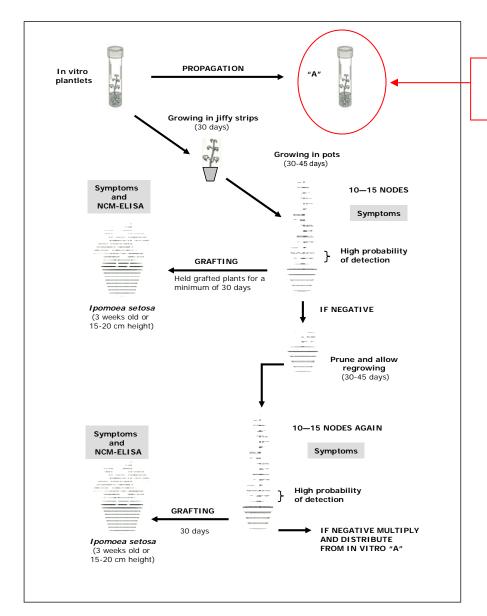
ISO 17025



Testing laboratory No. 4229



# Indexing procedure for sweetpotato viruses

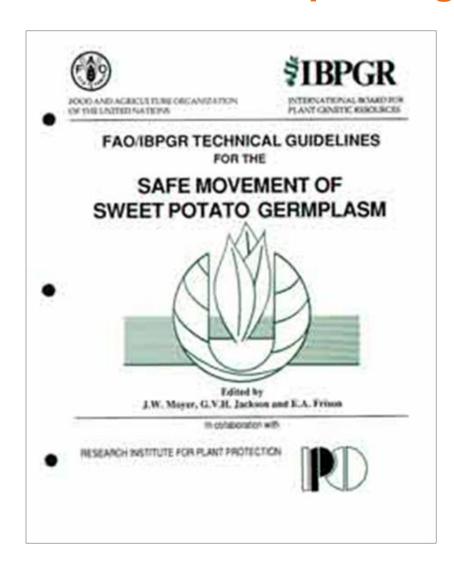


Use plantlets grown from the same meristem when distributing

28



## Safe movement of sweetpotato germplasm







SP plantlets in jiffys





**SP** plants in pots



Ipomoea setosa











**Pruned SP plants for regrowing** 



2<sup>nd</sup> grafting on *I. setosa* 





SP plants and *l. setosa* plants growing in the same greenhouse





**Starting record of symptoms** 

Preventive spraying of insecticides (controlling of whiteflies and aphids)

## **Sweetpotato summary record sheet**

|        |        |   |          | First  | t ara         | flina i | n / s | eto. |  |     |     |   |      | · · · ·  | Seco          | nnd | orafii | na in | 1 6 | eto≈ | ,   |     |      |     | 1       |
|--------|--------|---|----------|--------|---------------|---------|-------|------|--|-----|-----|---|------|----------|---------------|-----|--------|-------|-----|------|-----|-----|------|-----|---------|
|        |        | First grafting in /. setosa<br>NCM-EUSA |          |        |               |         |       |      |  |     |     | Second grafting in <i>I. setosa</i><br>NCM-EUSA |      |          |               |     |        |       |     |      |     |     | 1    |     |         |
| Record | NUMBER | Sweetpotato<br>Symptoms                 | Symptoms | FMV    | VG            |         |       |      |  | C-6 | MSV | CaLV  | CM/V | Symptoms | ₽MV           | VG  | CSV    | MMV   | ĽV  | CFV  | C-6 | MSV | CaLV | amv | RESULTS |
| 1      | 420446 |   |          |        |               |         |       |      |  |     |     |   |      |          |               | Г   |        |       | Г   |      | Г   |     |      |     |         |
| 2      | 400910 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 3      | 400942 |   |          | $\top$ | $\overline{}$ |         |       | Г    |  |     |     |   |      |          |               | Г   |        |       | Г   |      | Т   |     |      |     |         |
| 4      | 400948 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 5      | 400802 |   |          | -      |               |         |       | П    |  |     |     |   |      |          | $\overline{}$ | П   |        |       |     |      | Т   | -   |      |     |         |
| 6      | 403345 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 7      | 420826 |   |          |        |               |         |       | Г    |  |     |     |   |      |          |               | Г   |        |       | Г   |      | Г   |     |      |     |         |
| 8      | 441787 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 9      | 441785 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 10     | 421262 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 11     | 402730 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 12     | 400019 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 13     | 400841 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 14     | 400824 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 15     | 400498 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 16     | 400814 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 17     | 400570 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 18     | 401379 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      | П   |     |      |     |         |
| 19     | 400250 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 20     | 400827 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 21     | 400574 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 22     | 401458 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 23     | 440296 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
|        | 400225 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
|        | 400232 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
|        | 400612 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 27     | 402647 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
|        | 402646 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 29     | 402707 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 30     | 402661 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 31     | 400610 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 32     | 400836 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 33     | 400850 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 34     | 400861 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |
| 35     | 401066 |   |          |        |               |         |       |      |  |     |     |   |      |          |               |     |        |       |     |      |     |     |      |     |         |



## **Format of Final Results**

| 3  |    |   | Accession<br>number | Labcode | Collecting<br>number | Accession name  | SP symptoms | i. setosa symptoms | Serology   | PCR    | Results  | Observations    |
|----|----|---|---------------------|---------|----------------------|-----------------|-------------|--------------------|------------|--------|----------|-----------------|
| 38 | 35 | 1 | CIP 401066          | SG-1477 | GTM 392              | Camote Morado   |             | Vo,Vn              |            |        | REJECTED |                 |
| 39 | 36 | 2 | CIP 401448          | SG-1524 | DLP 2888             | Morada          |             |                    |            |        | APROVED  |                 |
| 40 | 37 | 2 | CIP 403380          | SG-1558 | INIVIT 9             | Blanco Especial |             |                    |            |        | APROVED  |                 |
| 41 | 38 | 2 | CIP 402666          | SG-1588 | INIVIT1049           |                 |             | RU,D,IVC           |            | Begomo | REJECTED |                 |
| 42 | 39 | 5 | CIP 402691          | SG-1592 | INIVIT1078           |                 |             | C,RU               |            | Begomo | REJECTED |                 |
| 43 | 40 | 5 | CIP 402721          | SG-1604 | INIVIT1216           |                 |             | RU                 |            | Begomo | REJECTED |                 |
| 44 | 41 | 6 | CIP 401130          | SG-1681 | GTM 1108             | Camote Morado   |             | IVC                |            | Begomo | REJECTED |                 |
| 45 | 42 | 7 | CIP 401375          | SG-1688 | SVG 27               | Six Weeks       |             | D,IVC              |            | Begomo | REJECTED |                 |
| 46 | 43 | 4 | CIP 402619          | SG-1702 | INIVIT 217           |                 |             | RU                 |            | Begomo | REJECTED |                 |
| 47 | 44 | 3 | CIP 402655          | SG-1717 | INIVIT1038           |                 |             | D,Ve,Vn,Ln         | SPCaLV     |        | REJECTED | SPCaLV (PCR)    |
| 48 | 45 | 5 | CIP 402696          | SG-1731 | INIVIT1084           |                 |             | C,IVC              |            | Begomo | REJECTED |                 |
| 49 | 46 | 1 | CIP 403435          | SG-1786 | CESDA861607          | 86-1607         |             |                    |            |        | APROVED  |                 |
| 50 | 47 | 5 | CIP 400789          | SG-1790 | CENDA 20             | Jacobina 5      |             | RD,D,Vc,Vn,Ln      | SPCaLV     | Begomo | REJECTED | Virus C-9 (PCR) |
| 51 | 48 | 2 | CIP 401120          | SG-1816 | GTM 949              | Camote Blanco   |             |                    |            |        | APROVED  |                 |
| 52 | 49 | 5 | CIP 401277          | SG-1827 | DLP 3898             | Rojo-kinit      |             |                    |            |        | APROVED  |                 |
| 53 | 50 | 1 | CIP 420565          | SG-1852 | DLP 66               | Espelma         |             | D,Vo               | SPFMV,SPVG |        | REJECTED |                 |
| 54 | 51 | 6 | CIP 420163          | SG-1859 | DLP 123              | Morado Morado   |             |                    |            |        | APROVED  |                 |
| 55 | 52 | 2 | CIP 420181          | SG-1907 | DLP 887              | unknown         |             | Ср                 | SPFMV,SPVG |        | REJECTED |                 |
| 56 | 53 | 6 | CIP 420715          | SG-1935 | DLP 1312             | Zapallona       |             | RD,Vo              | SPFMV,SPVG | Begomo | REJECTED |                 |
| 57 | 54 | 6 | CIP 420291          | SG-2089 | DLP 3549             | unknown         |             |                    |            |        | APROVED  |                 |
| 58 | 55 | 5 | CIP 420113          | SG-2154 | ARB 323              | Camote Papa     |             | Ср                 | SPFMV,SPVG |        | REJECTED |                 |
| 59 | 56 | 1 | CIP 420114          | SG-2156 | ARB 347              | Camote          |             |                    |            |        | APROVED  |                 |
| 60 | 57 | 6 | CIP 420488          | SG-2172 | ARB 425              | Espelma         |             |                    |            |        | APROVED  |                 |
| 61 | 58 | 3 | CIP 442115          | SG-2283 | IITA-CL 57           |                 |             | C,RU,D             |            | Begomo | REJECTED |                 |
| 62 | 59 | 2 | CIP 443083          | SG-2384 | IITA-CL 249          | TIS 2180        |             | C,B                |            | Begomo | REJECTED |                 |
| 63 | 60 | 3 | CIP 442858          | SG-2452 | IITA-CL 377          | TIS 8030        |             |                    | l          |        | APROVED  | <u> </u>        |