

# Sweetpotato Research Front

Kyushu National Agricultural Experiment Station (KNAES)

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## Contents

	page
1. Cover Story : The 9th Research Meeting for Root Crops .....	1
2. Research Paper : Detection of Sweetpotato Feathery Mottle Virus by Reverse Transcription-Polymerase Chain Reaction Selection of Sweetpotato Varieties with High Content of $\beta$ -Amylase .....	2
3. Research News : Introduction of Laboratories of Research Project Team 2 and Marketing System .....	4
4. Center and Facilities for Sweetpotato Research : Analytical Assessment Center for Producing Crops with High Quality .....	5
5. Reader's Talk : Toward Sustainable Development of SPORF ! .....	6

## The 9th Research Meeting for Root Crops

*Osamu Yamakawa*

**Chief of Sweetpotato Breeding Lab. at KNAES**



The meeting was held from Dec. 7 to 8 in 1995 in Kagoshima Pref. This meeting is organized every year and many researchers from national or prefectural experiment stations, universities and private companies attend

the meeting. The program related to sweetpotato was as follows,

1. Newly distributed breeding lines were selected by their performance at Agri. Exp. Stn. Kyushu-122 suitable for processing and table use has a high carotene content, high yielding ability and good shape. Kyushu-123 and Kyushu-124 which have a high starch content and give a high yield are suitable for the starch industry. Kyushu-125 suitable

for table use exhibits high yielding and a good shape.

2. Problems relating to the ecology and control of weevils in Tanegashima island were discussed.

3. Nine research topics were presented as follows ;  
a) effect of low temperature treatment on the quality of sweetpotato for table use. b) effect of cultivation conditions on yield and anthocyanin content for colorant industry. c) effect of previous cropping on quality of sweetpotato for table use. d) effect of soil properties on quality and shape of sweetpotato for table use. e) varietal difference in anti-oxidation ability. f) effect of root powder application on yeast-growth promotion. g) varietal differences in the characteristics of starch gel. h) development of snack food. i) suppression of melanin synthesis by sweetpotato extract.

4. The highlights of the 1st Chinese-Japanese Symposium on Sweetpotato and Potato were reported.

# Research Paper

## Detection of Sweetpotato Feathery Mottle Virus by Reverse Transcription-Polymerase Chain Reaction

*Masatoshi Onuki and Kaoru Hanada*

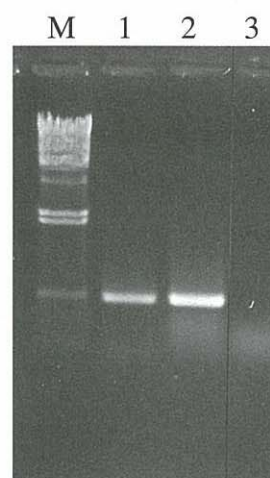
Laboratory of Virus Diseases

Sweetpotato feathery mottle virus (SPFMV) commonly occurs in areas cultivated with sweetpotato throughout the world. Several strains of SPFMV have been observed overseas and in Japan. Among the Japanese strains, both SPFMV severe strain (SPFMV-S) and the ordinary strain (SPFMV-O) are important because SPFMV-S is the causal agent of russet crack (“obizyo-sohi”, in Japanese) and SPFMV-O is serologically closely related to SPFMV-S.

In recent years, it was reported that reverse transcription-polymerase chain reaction (RT-PCR) is highly sensitive and suitable for the detection of RNA viruses. It was already demonstrated that SPFMV-S and -O could be easily detected from inoculated morning-glory (*Ipomoea nil*) by RT-PCR. However direct detection of SPFMV from infected sweetpotato was not successful due to the presence of inhibitory compound(s) for RT-PCR in the leaf extract. Therefore we developed a simple method using CF11 cellulose powder for the extraction of SPFMV-RNA from infected sweetpotato leaves. Now, we are able to detect SPFMV from infected sweetpotato by RT-PCR. The figure shows the agarose gel electrophoretic

patterns of the DNA fragments amplified by RT-PCR from leaf extracts of sweetpotato infected with SPFMV-S and -O.

Subsequently, we will attempt to detect other filamentous viruses, namely sweetpotato latent virus and sweetpotato symptomless virus by using RT-PCR.



**Fig.** Agarose gel electrophoresis of DNA fragments amplified by RT-PCR from leaf extracts of sweetpotato infected with SPFMV-S and -O.

M : molecular weight marker ( $\lambda$ /Hind III), lane 1 : amplified fragment from leaf extract of sweetpotato infected with SPFMV-O, lane 2 : amplified fragment from leaf extract of sweetpotato infected with SPFMV-S, lane 3 : healthy control (leaf extract from virus-free sweetpotato)

# Research Paper

## Selection of Sweetpotato Varieties with High Content of $\beta$ -Amylase

*Makoto Yoshimoto, Shigenori Okuno, Toru Kumagai\* and Osamu Yamakawa\**

Laboratory of Upland Crop Utilization

\*Laboratory of Sweetpotato Breeding

$\beta$ -Amylase [EC 3.2.1.2] is an important enzyme for the industrial production of maltose as sweetener. Presently the enzyme from soy bean or malt is used. Although sweetpotato shows a high content of the enzyme,  $\beta$ -Amylase is not used industrially due to contamination with  $\alpha$ -amylase [EC 3.2.1.1], troublesome concentration, and low-heat resistance.

We carried out research on sweetpotato  $\beta$ -amylase for industrial utilization. In this paper, we selected a sweetpotato variety with a high content of  $\beta$ -amylase and analyzed the relationship between the enzyme activity and harvest time.

$\beta$ -Amylase activity was assayed using a procedure based on the hydrolysis of *p*-nitrophenyl maltopentaoside.

Figure 1 shows the results of ten out of 20 varieties, indicating that Kyushu-114 and Q91193-2 displayed a high content of the enzyme. Activity of both varieties was significantly higher than that of Shiroyutaka which has ever shown the highest enzyme activity.

Relationship between the  $\beta$ -amylase activity and harvest time is depicted in Fig. 2. The enzyme activity of all the varieties harvested on Oct. 31 was significantly higher than that of the varieties harvested on Sep. 4, suggesting that the later the harvest time, the higher the enzyme activity.

We selected two varieties with a high content of  $\beta$ -amylase. Furthermore, it is necessary to investigate the contamination with  $\alpha$ -amylase and characterize enzymatically  $\beta$ -amylase in the selected varieties.

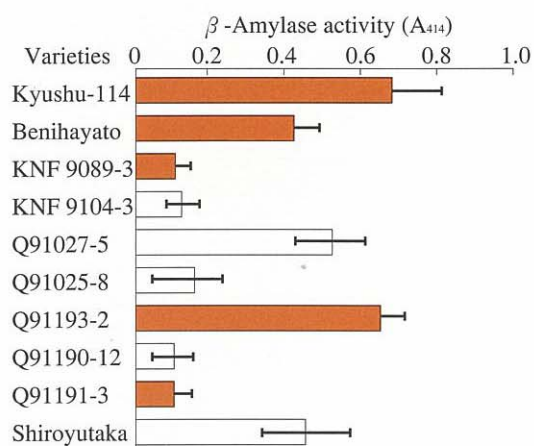


Fig. 1  $\beta$ -Amylase activity of sweetpotato varieties. mean  $\pm$  SD (5 samples)

Orange bar, orange flesh; White bar, white or yellow flesh

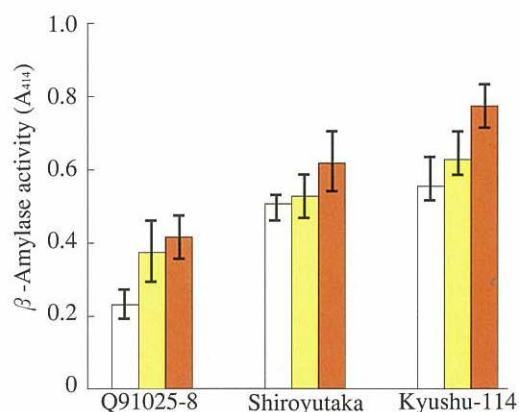


Fig. 2 Changes in  $\beta$ -amylase activity by harvest time.

White bar, Sep. 4; Yellow bar, Oct. 1; Orange bar, Oct. 31

# Research News

## Research Project Team 2 (Miyakonojo)

Research objective of this team is to develop techniques for the production of upland crops compatible with environmental conservation. For this purpose, a new tillage method to control nitrate-nitrogen leaching by hardening the ridge-surface and techniques for reducing nitrate-nitrogen leaching by organic matter scattering in subsoil are being studied.

In the case of sweetpotato research, the above-mentioned method for ridge-surface hardening is applied. The appli-

cation of this method whereby the amount of run-off water increases and the amount of percolation water decreases evo-

lutes to reduce the amount of nitrate-nitrogen leaching, and enhances the quality of sweetpotato.



Research Project Team2 ▶

## Laboratory of Marketing Systems (Nishigoshi)

Due to the decrease in sweetpotato starch prices, production for household consumption and processed

foods has increased in the southern part of the Kyushu district. As a result, it is necessary to reorganize the

conventional marketing systems to adapt them to various uses. We developed marketing decision support systems for scheduling production. The studies cover the following Topics:

1. Investigations into actual conditions of sweetpotato marketing for various uses.
2. Reorganization of sweetpotato marketing systems.



◀ Preparation and selection in a distribution center

# Center and Facilities for Sweetpotato Research

## Analytical Assessment Center for Producing Crops with High Quality

### Outline of Center

Analytical Assessment Center for Producing Crops with High Quality is located in Nishigoshi, Kumamoto, Japan, and is mainly used by postharvest research groups. Researchers working in this center enjoy to study a large variety of crops such as sweetpotato, potato, soybean, rice, wheat, barley, fruits, vegetables, sugarcane, buckwheat, sunflower and mulberry. Research for crops with high

quality is carried out by using several postharvest technology including quality feature analysis and techniques for quality evaluation. Also, research involves quality modification during the storage of crops, and development of new technology utilizing for food science. Postharvest studies of this center are performed in co-operation with crop breeding groups in the Kyushu area. Recently, sweetpotato varieties containing anthocyan pigment

(see SPORF No.1) and a soybean line lacking all seed lipoxygenase isozymes have been clarified to be superior as a food ingredient. In addition, near infrared spectrometer enable to determine the contents of protein and fats in soybean, sunflower, etc. non-destructively. Information on other advanced studies is included in "Post-harvest Research" (<http://ss.knaes.affrc.go.jp/sato/>).

### Main Facilities

NMR spectrometer, ESR spectrometer, Near infrared spectrometer, UV/VIS spectrophotometer, Fluorescence spectrophotometer, Super-high sensitive chemiluminescence analyzer, Microplate reader, Headspace gas chromatograph (GC), High performance liquid chromatograph (HPLC) GC-LC/MS analyzer, TLC-FID analyzer, Differential scanning calorimeter, Far infrared radiation oven, Freeze-drying apparatus, Centrifuges, Low pressure liquid chromatograph, SMART system, High-performance anion-exchange chromatograph equipped with a pulsed amperometry, Analytical electrophoresis, Preparative electrophoresis, Preparative HPLC, Protein sequencer, Peptide synthesizer, CO<sub>2</sub> controlled room, Clean bench, Air-conditioned animal rack, Bio image analyzer, Clinical automatic analyzer



Analytical Assessment Center



Staff of Postharvest Research Group

# Reader's Talk

## Letters to the editor

### Toward Sustainable Development of SPORF!

*Masashi Kobayashi*

**Project Leaders Head  
Bio-oriented Technology  
Research Advancement  
Institution (BRAIN)**

The first issue of SPORF has successfully delivered the strong intention of sending messages to the world from the scientists working in sweetpotato research.

Scientific information from Japan has been reputed globally as "gray literature" to our regret.

I hope earnestly that sustainable development of SPORF will to withdraw such dispute as far as Japanese sweetpotato researches are concerned.

The most attractive aspect of sweetpotato I think is its genetic diversity. Tremendous wide variations are observed in root shape, color and contents. They are not only used as staple and for side food such as snacks, but also as animal feed and as industrial raw materials. Sweetpotatoes are sometimes cultivated for pharmaceutical use and even for ornamental purpose. I do not know any other crop but sweetpotato that has been con-

tributing to mankind through its versatility according to local needs. What causes such genetic diversity to exist in sweetpotato? I assume the secret is hidden in its genetic background of evolutionary autopolyploidy. Whether this is true or not, drawing out the special attributes chiefly depends on scientific competence and passion of researchers. In the end, I expect new scientific breakthroughs by the researchers at the forefront of science as well as contribution to the further sustainable development of SPORF.

## Announcements

Membership of SPORF is open to sweetpotato researchers of all nations, and SPORF members can receive the SPORF publication free of charge. SPORF is published twice a year. Those who are interested in receiving this publication may write to the SPORF editor. Please type all information listed below:

Name:

Affiliation:

Address:

Fax:

E-mail:

And also, contribution to "Letters to the Editor" are welcome. Please address all correspondence concerning editorial matters to the SPORF editor. Articles should not exceed 250 words.

## Editor's note

### SPORF, SPORF, SPORF.....

January and February are busy months for researchers, because many SPORF members at KNAES have to attend scientific meetings. However, we received letters for the publication of SPORF from researchers and the second issue of SPORF was eventually completed. We thank the authors and hope that the articles will contribute to the development of sweetpotato research



### Sweetpotato Research Front (SPORF)

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