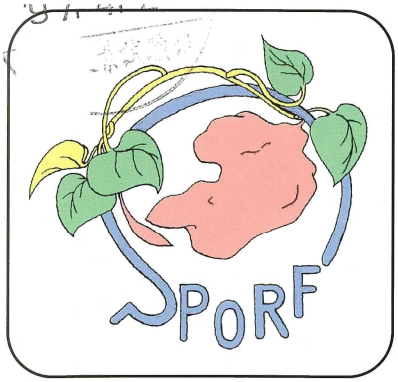
ISSN 1341-9730



Sweetpotato Research Front

Kyushu National Agricultural Experiment Station (KNAES) No.4, March 1997

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Report on Research Meeting for Root Crops held in Kumamoto Prefecture

Osamu Yamakawa
Chief of Sweetpotato Breeding Lab., KNAES

The 10th research meeting for root crops was held from December 5 to 6, 1996 in Kumamoto Prefecture. More than 70 researches working with sweetpotato and potato go there to exchange views on the results and plans of experiments. The discussions on sweetpotato are summarized as follows.

1. Performance trials conducted by the Pref. Agri. Exp. Stn. for newly distributed breeding lines were described. Kyushu-126 with a high starch content and high yield is suitable for the starch industry. It has a nice shape and is suitable for processing and table use. Kyushu-127 and kyushu-128 show a good taste and good shape for table use. Especially, kyushu-128 gives a high yield in early harvest.

2. A presentation on production and processing of sweetpotato in Kumamoto was given.

3. Twelve short research topics were presented as follows: 1) Promising cultivars for direct planting culture. 2) New natural flowering sweetpotato lines as stocks for inducing flowering buds. 3) Resistance to the root knot nematode and high temperature. 4) Sweetpotato variety improvement in the Philippines using polycross method. 5) New beverages made from sweetpotato. 6) Noodles made from sweetpotato. 7) Relationship between taste and cultural conditions. 8) Extraction of anthocyanin pigments by ethanol solution. 9) Antimutagenic activity of water extracted from sweetpotato. 10) Antioxidative and radical9-scavenging activities of ethanol extract from sweetpotato. 11) Hepato-protecting activity of purple colored-sweetpotato juice. 12) Effect of planting and harvesting dates on sweetpotato starch properties.

Research Paper

Pratylenchus coffeae Virulent Races on Sweetpotato

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Laboratory of Plant Nematology

In Japan, *Pratylenchus coffeae* (coffee root-lesion nematode) is a well-documented pest of sweetpotato, taro, potato, konjak, upland rice, and soy bean. Due to the yield reduction up to 30 % in susceptible sweetpotato cultivars, *P. coffeae* has been a major target for the development of pest resistance in sweet potato breeding programs. Even so, injury of sweetpotato caused by this nematode has only been recognized in Miyazaki and Kagoshima in Kyushu Island. We compared *P. coffeae* populations from separate locations to determine; (1) whether the reproduction of the populations on sweetpotato was different, and (2) whether the populations differed in their virulence to sweetpotato.

(1) Five populations of *P. coffeae* apparently differed in reproductive fitness on susceptible (Koganesengan and Norin-2) and resistant (Minamiyutaka) sweetpotato cultivars. The Miyazaki and Okinawa populations differed from the Saitama, Mie, and Nagasaki populations in exhibiting a significantly higher reproduction rate ($P<0.05$, LSD) on susceptible sweetpotato cultivars (Fig. 1). The latter three populations did not propagate well on all the sweet potato cultivars, suggesting that sweetpotato was a poor host for these populations. (2) Ninety days after the inoculation of 500 nematodes, the Miyazaki and Okinawa populations produced larger lesions (lesion index) on Koganesengan storage roots ($P<0.05$, Tukey) than the Saitama (3 populations), Mie, Nagasaki, Nagano, and Kagoshima populations (Fig. 2). The results obtained demonstrate the presence of virulent races among the Japanese *P. coffeae* populations. However, it is assumed that *P. coffeae* in Japan may consist of more than 2 species, because the application of the PCR-RFLP technique using the ITS region of r-DNA to the races revealed distinctive polymorphism.

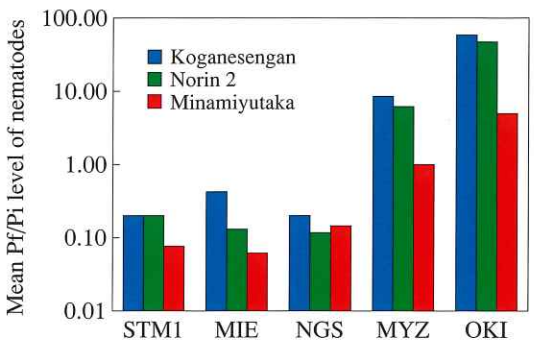


Fig.1. Reproduction rates (final population (Pf) / initial population (Pi)) of five *Pratylenchus coffeae* populations from different locations in Japan on Koganesengan (susceptible), Norin-2 (susceptible), and Minamiyutaka (resistant) sweetpotato cultivars 55 days after inoculation at 29±2 °C (Pi = 500 / 200 g soil, n = 3). STM1: Urawa, Saitama, MIE: Mie, NGS Nagasaki; MYZ: Miyakonojo, Miyazaki, OKI: Ishigaki, Okinawa

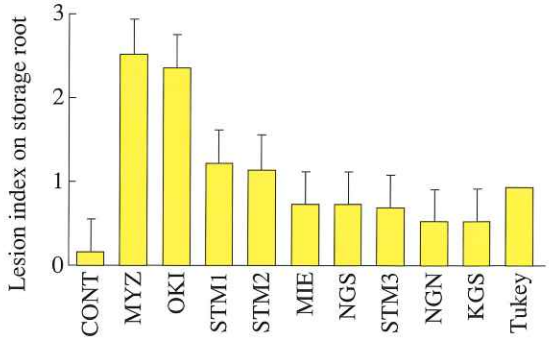


Fig. 2. Effects of *Pratylenchus coffeae* populations on root-lesion of sweetpotato cultivar, Koganesengan, 90 days after inoculation (Pi = 500 / 200 g soil). OKI: Okinawa, MYZ: Miyazaki, NGS: Nagasaki, KGS: Kagoshima, STM1 and STM2: Urawa, Saitama; STM3: Sayama, Saitama; NGN: Nagano; MIE: Mie. Bars denote standard deviations for seven replications.

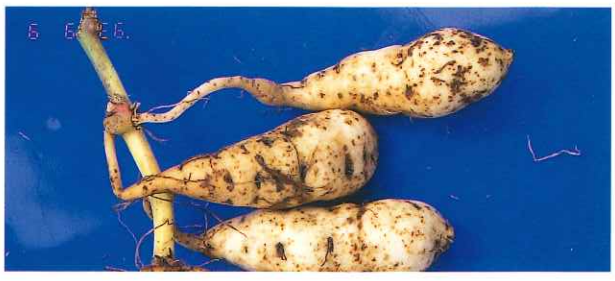


Fig. 3. Storage root lesion caused by *Pratylenchus coffeae* on Koganesengan sweetpotato cultivar.

Research Paper

Hepato-protective Activity of Purple-Colored Sweetpotato Juice

Ikuo Suda, Shu Furuta, Yoichi Nishiba, Osamu Yamakawa, Kazusato Matsugano** and Koichi Sugita***

Laboratory of Storage and Processing
*Laboratory of Sweetpotato Breeding
**Miyazaki JA Food Research and Development Inc.

The new cultivar "Ayamurasaki" with a high anthocyanin content is an outstanding food ingredient. For example, purple-colored sweetpotato juice (Fig. 1 right) can be made from roots with purple flesh. The juice is colored and very tasty, and exhibits *in vitro* a higher antioxidative activity than juice made from apple, tomato or carrot. Present study was designed to analyze the physiological function of this purple-colored sweetpotato juice *in vivo*.

Experimental intoxication induced by carbon tetrachloride (CCl_4) is widely used as model of liver injury in rats. Therefore CCl_4-treated rats could be used to study the protective effect of purple-colored sweetpotato juice on acute liver injury. Male Wistar rats were divided into 3 groups, treated as shown in Fig 2. As a result, pretreatment with purple-colored sweetpotato juice orally for 5 consecutive days prior to CCl_4 treatment effectively reduced the serum GOT and GPT levels (Fig. 2). These results reveal a possible hepato-protective role of the components in purple-colored sweetpotato juice or their metabolites against CCl_4-induced hepatotoxicity *in vivo*.

Fig. 1 Orange- and purple-colored sweetpotato juice.

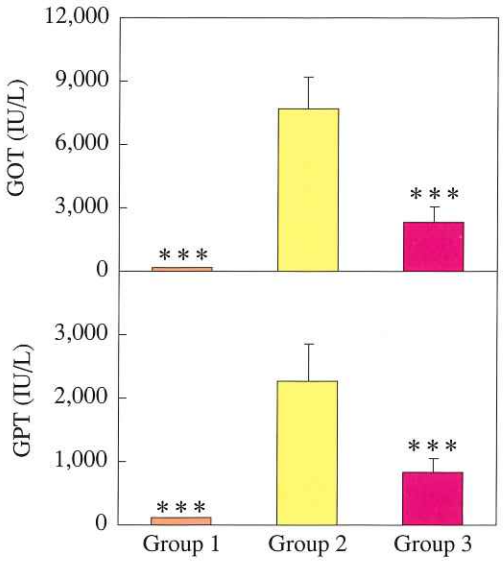


Fig. 2 Effects of purple-colored sweetpotato juice on the serum GOT and GPT levels in CCl_4-treated rats.

Group 1: tap water and olive oil
Group 2: tap water and CCl_4 in olive oil
Group 3: purple-colored sweetpotato juice and CCl_4 in olive oil

Purple-colored sweetpotato juice was administered orally (0.8ml/100g rat/day) for consecutive days. CCl_4 in olive oil (0.05ml/0.2ml/100g rat) was given orally 12h after the administration of the last dose of juice. Rats were sacrificed at 24h after the administration of CCl_4, and serum GOT and GPT levels were measured as indices of liver injury. Values are means±SD, n=8. Asterisks indicate significant difference from Group 2 ($p<0.001$).

Research News

The following laboratories are involved in the sweetpotato research at KNAES. "RESEARCH NEWS" introduces some of the achievements of these laboratories.

Nishigoshi

- Lab.of Molecular Plant Pathology
- Lab.of Plant Nematology
- Lab.of Plant Biotechnology
- Lab.of Crop Quality,Storage and Processing
- Lab.of Soil Resources & Plant Nutrition

Miyakonojo

- Research Project Team 2
- Lab.of Upland Crop Genetic Resources
- Lab.of Sweet potato Breeding
- Lab.of Crop Production Management
- Lab.of Farm Operation Mechanization Systems
- Lab.of Upland Crop Utilization

Laboratory of Plant Biotechnology (Nishigoshi)

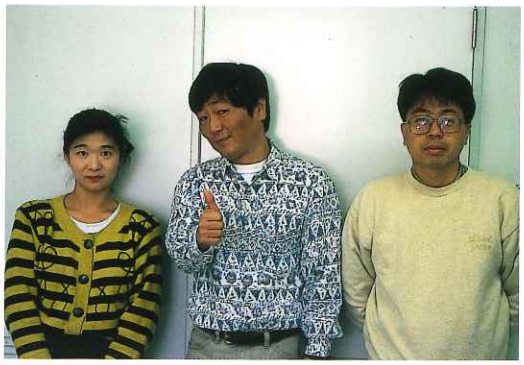
Mesophyll protoplasts of a Japanese sweetpotato cultivar, Chikei 682-11 were electroporated to introduce the hygromycin B phosphotransferase (HPT) gene of a selection marker and the coat protein gene of sweetpotato feathery mottle virussevere strain (SPFMV-S) for virus resistance. It was confirmed that the HPT and SPFMV-S coat protein genes were integrated into the genome of regenerated plants by Southern hybridization analysis. Also,Northern and Western hybridization analysis revealed the gene expression of the SPFMV-S coat protein. Characterization of the regenerated plants for biosafety as well as the virus resistance is underway.

Research News

Laboratory of Upland Crop Genetic Resources (Miyakonojo)

Laboratory of Upland Crop Genetic Resources was transfered to Miyakonojo city from Miyazaki city in Oct. 1996. To contribute to the breeding of upland crops, especially sweetpotato for the Kyushu district, research subjects taken up in the laboratory are as follows:

1) Collection, preservation and evaluation of vegetatively propagated crop genetic resources i.e., sweet potato related wild species, matrush and tropical forage grasses etc.
2) Development of new technologies for the utilization of genetic resources including biotechnology.
3) Development of breeding materials from genetic resources.



Staff of Laboratory of Upland Crop Genetic Resources

Preservation of Genetic Resources (Jan., 1997)

Plant	accession number
Sweet potato-related wild species	350
Grasses and forage crops	146
Matrush (IGUSA)	171

Laboratory of Sweetpotato Breeding (Miyakonojo)

Our laboratory is responsible for developing new sweetpotato cultivars for starch or fermentation industry, table use consumption, food processing, and so on. We released "Joy White" for "shochu", a traditional Japanese spirit in 1994 and "Ayamurasaki" for colorant production and sweetpotato powder in 1995. This year we are planning to release a new cultivar "Kyushu-120" (tentative name), for sweetpotato "juice". This cultivar has an orange flesh, does not exhibit degradation after processing, displays a low dry matter content and high yielding ability.

In Japanese sweetpotato breeding, sweetpotato has to be grafted onto morning glory rootstock to induce flowering. However, since it is difficult to cultivate good rootstocks, we are trying to select rootstocks from naturally flowering sweetpotato lines. Up to now, we have selected several promising lines.

Flowers of sweetpotato

Staff of our Laboratory

Reader's Talk

Letter to the editor

Sweetpotato Research in Malaysian Agricultural Research and Development Institute

Tan Swee Lian

Food and Industrial Crops Research Centre, MARDI*

Sweetpotato is second in importance to cassava (*Manihot esculenta Crantz*) as a root crop in Malaysia. Unlike cassava which is grown for the starch industry, sweetpotato is cultivated mainly for the somewhat small fresh food market. MARDI (Malaysian Agricultural Research and Development Institute) plans to change this minor role of sweetpotato and transform it into an industrial crop. There are three main areas which can be addressed.

1. Sweetpotato as a starch source
2. Sweetpotato as a grain substitute (energy component) in livestock feeds
3. Sweetpotato as a raw material for value-added food products

Currently, I am mainly evaluating and selecting germplasm for the first and third end-uses. The second one will only be possible if a low-cost technique for drying the chipped roots can be developed. (Any reader having such information: please contact me).

Personally, I feel that there will be greater possibilities of working on value-added food products. Sweetpotato should be promoted as a health food, due to its high content in dietary fibre, certain vitamins and minerals. In Malaysia, white potato (*Solanum tuberosum*) is usually consumed as food although this temperate crop dose not grow well under local conditions, and all the consumption depends on imports. The white potato cooked or prepared in certain ways could be replaced by sweetpotato genotypes with a low sugar content.

Along with the objective to place emphasis on sweetpotato as an industrial crop, my colleagues at MARDI are also carrying out studies for the developments of mechanized field operations, sustainable soil fertility practices and crop rotations (for fertility as well as pest management).

SPORF offers a useful forum for sweetpotato workers throughout the world to present their research work. I am especially impressed by the range of food products from sweetpotato that have been developed in Japan.

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Announcements

Membership of SPORF is open to sweetpotato researchers of all nations, and SPORF members can receive the SPORF publication free of charge.

Also, contribution to "Letter to the editor" are welcome. Everyone can utilize SPORF as a forum to exchange information on sweetpotato research. You can introduce not only your current research field, future work plans and research strategy, but also calendar events, announcements and news about your department, organization or company. Photographs of working center and facilities, staff of research group, and sweetpotato cultivars, etc., are also accepted. Please address all correspondence concerning editorial matters to the SPORF editor.

Editor's note

SPORF is published twice a year with the cooperation of five departments of KNAES. At the beginning of the fiscal year, the editorial staff are making great efforts to raise money for publication of SPORF from the KNAES budget. Presently report of SPORF can be seen on internet. Please access URL http://ss.knaes.affrc.go.jp/sporf/sporf.html. (A.Y.)

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Published by SPORF with support from the Kyushu National Agricultural Experiment Station, MAFF, Kumamoto 861-11, JAPAN.