

Sweetpotato Research Front

Kyushu National Agricultural Experiment Station

No.1, December 1995

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Objective of the First Issue of Sweetpotato Research Front (SPORF)



Headquarters of KNAES

Koichi Nakashima
Director of Department of
Upland Farming of KNAES

We are working for the farmers in the upland area of Kyushu and Okinawa. One of the main crops here is sweetpotato. Research groups are engaged in research relating to breeding, processing, mechanization, and cropping of sweetpotato in our department. I hope sweetpotato researchers over the world will exchange their information through this newsletter.

Shigeo Tanaka

Director General of Kyushu National
Agricultural Experiment Station (KNAES)

KNAES is a research institute responsible for the promotion of agriculture in the southern area of Japan (Kyushu and Okinawa). Although farmers grow various crops, sweetpotato is a main crop. As there are many researchers at KNAES who carry out studies on sweetpotato, research achievements will be introduced in the form of newsletter.



Institute in Miyazaki

Research Paper

New Cultivar "Ayamurasaki" for Colorant Production

Masaru Yoshinaga

Laboratory of Sweetpotato Breeding

"Ayamurasaki" is a newly released cultivar with a high anthocyan content, developed by Kyushu National Agricultural Experiment Station and officially registered by the Ministry of Agriculture, Forestry and Fisheries in 1995. Anthocyan extracted from roots with purple flesh is used for confectionery and various foods as natural colorant. Deep purple flour and paste are also used as materials for bread, snacks and noodles.

Origin

"Ayamurasaki" previously tested as "Kyushu-113", originates from a cross made between "Kyushu-109" and "Satsumahikari" in 1988. "Kyushu-109" originates from indigenous cultivars "Yamagawamurasaki" and "Chiranmurasaki" both producing roots with purple flesh. "Satsumahikari" is a non-sweet cultivar lacking β -amylase activity.

Yield and other traits of "Ayamurasaki" in yield trial (1991-1994).

Traits	Ayamurasaki ¹⁾	Kyushu-109 ¹⁾
Root yield(t/ha)	19.2	12.4
Root size(g)	161	191
No. of roots per hill	3.0	1.8
Dry matter content(%)	35.1	30.0
Starch content(%)	21.9	16.6
Color value	8.9	5.8
Brix(%)	3.8	4.6
Nematode resistance ²⁾		
Root knot nematode	SR	M
Root lesion nematode	SR	R

1) Data in standard harvesting.

2) R ; Resistant, SR ; Slightly resistant, M ; Medium

Description

"Ayamurasaki" leaves are green and lobed. Nodes of vines are purplish. Storage roots are elongated fusiform with uniform good shape and dark-purple skin. The flesh is uniformly deep purple. "Ayamurasaki" shows an extremely high anthocyan content in roots. The color value based on the absorption coefficient (FAO 1983) is about 1.5 times higher than that of "Kyushu-109" and about 5 times higher than that of "Yamagawamurasaki".

Performance

Yield of "Ayamurasaki" was higher than that of "Kyushu-109". The dry matter and starch contents were higher than those of "Kyushu-109" and "Yamagawamurasaki". Roots were slightly resistant to root knot and root lesion nematodes.



Research Paper

Antioxidative Activity of Sweetpotato Containing Anthocyan Pigment

Shu Furuta, Yaichi Nishiba and Ikuo Suda

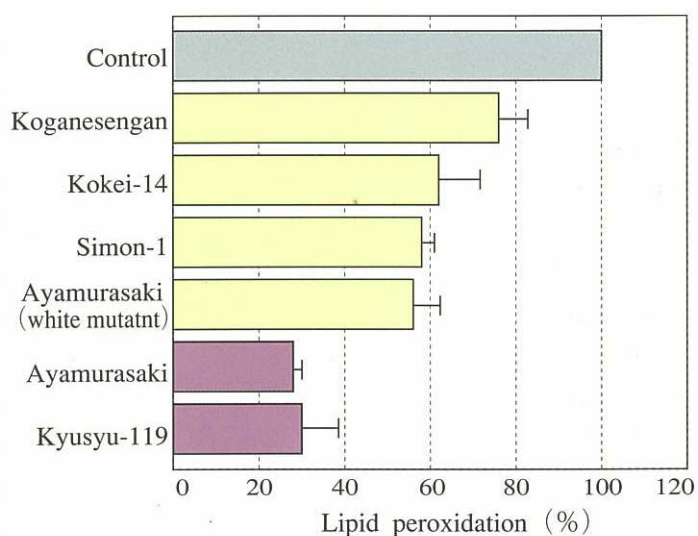
Laboratory of Storage and Processing

Recently antioxidants have attracted special attention because they can protect human body from oxidative stress which may cause many diseases including cancer and aging. In the past, BHT and BHA had been used widely. However, since their use was reported to be associated liver damage, we carried out studies to identify more effective and safer antioxidants from natural sources. In this study, we observed that the ethanol extracts from sweetpotatoes with purple flesh exhibited a strong antioxidative activity.

Although many methods have been applied for the evaluation of the antioxidative activity of test substances, they required technical skill and were time-consuming. Therefore, we developed a new and simple method based on the auto-oxidation of linoleic acid, which enables to estimate the antioxidative activity within a few hours. Figure shows the antioxidative activity of the ethanol extract from six cultivars of sweetpotato. Low lipid peroxidation results in a high antioxidative activity. Two cultivars containing anthocyan pigment, such as "Ayamurasaki" and "Kyushu-119", showed a higher antioxidative activity than white flesh cultivars, such as "Koganesengan", "Kokei-14", "Simon-1", and white mutant from "Ayamurasaki".

As a result, we observed that sweetpotato cultivars with purple flesh exhibit a strong antioxidative activity. It remains to be determined whether the antioxidative activity is

associated only with the anthocyan pigment. Further studies are in progress to determine which components are responsible for the antioxidative activity.



Antioxidative activity of ethanol extracts from sweetpotato

Freeze-dry sample equivalent to 2.5g of fresh weight was extracted four times with ethanol and adjusted to 25 ml. Each sample (20 μ l) was mixed with 20 μ l of 2 mg/ml linoleic acid in ethanol, which was incubated at 80 $^{\circ}$ C for 60 min and subjected to DETBA assay (Suda et al. : *Biosci. Biotechnol. Biochem.*, 58, 14-17, 1994). Reported values are the mean \pm SD (n=4-7). Control values without antioxidants correspond to 100% lipid peroxidation.

RESEARCH NEWS

The "KNAES" contains multi-disciplinary laboratories which develop new technology or information for sweet potato research. 'RESEARCH NEWS' introduces some of the research achievements of these laboratories.

Nishigoshi

- Lab. of Virus Diseases
- Lab. of Plant Nematology
- Lab. of Farm Management
- Lab. of Marketing System
- Lab. of Plant Biotechnology
- Lab. of Crop Quality
- Lab. of Storage and Processing
- Lab. of Soil Conservation and Improvement

Miyakonojo

- Research Project Team 2
- Lab. of Upland Crop Genetic Resources
- Lab. of Sweetpotato Breeding
- Lab. of Cropping Systems
- Lab. of Upland Soils
- Lab. of Upland Crop Utilization

Laboratory of Plant Nematology (Nishigoshi)

Due to the warm climate and intensive cropping, plant parasitic nematodes occur frequently in Kyushu causing serious damage to many field crops as well as vegetables. Some of them such as the southern root-knot nematode, *Meloido-gyne incognita* and the coffee root-lesion nematode, *Pratylenchus coffeae* attack sweetpotato and cause a severe reduction of the quality and quantity of storage roots. Growers apply nematicides before planting sweetpotato for the control of the nematodes.

Current research projects in our laboratory related to sweetpotato are as follows:

1) Development of integrated management systems for the control of *M. incognita* using a natural enemy, the bacterium

Pasteuria penetrans and crop rotation,

2) Determination of pathological races in *Pratylenchus*

species,

3) Interaction of *M. incognita* and *P. coffeae* and damage to sweetpotato caused by them.



Damage to storage roots of sweetpotato caused by *M. incognita* showing constriction, cracking and dent. On left side there is a normal storage root.

RESEARCH NEWS

Laboratory of Cropping Systems (Miyakonojo)



Damage of sweetpotato by nematodes

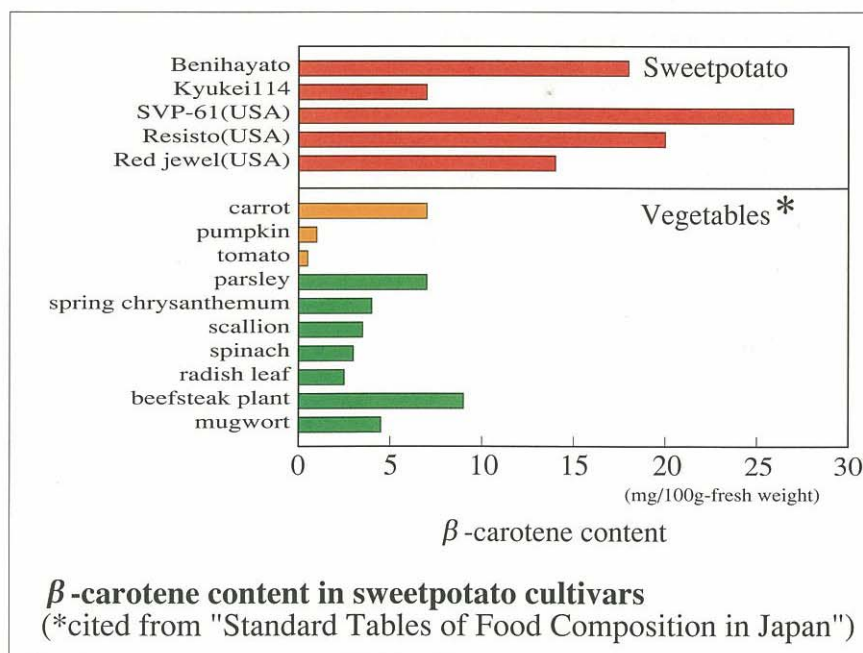
Development of cropping systems and improvement of crop productivity have been studied for upland crops in our laboratory. Particularly sweetpotato is one of the main upland crops in the southern part of the Kyushu district. Then we attempted to analyze the effect of cultivation conditions on the yield and the

properties of tuberous roots. The research themes relating to sweetpotato are as follows:

1. Analysis of the relationship between the cropping systems and yield or tuberous root properties.
2. Investigation of the effect of crop management on the yield and pigment content of tuberous roots.

Laboratory of Crop Quality (Nishigoshi)

The useful constituents of sweetpotatoes have been analyzed in our laboratory. In our recent research activities, the carotenoid composition of 25 sweetpotato cultivars was investigated using HPLC. All the cultivars with orange flesh used in this study showed a similar carotenoid composition, which consisted mostly of β -carotene. This predominance of β -carotene throughout the cultivars characterizes the carotenoid composition of sweetpotato. The cultivar Benihayato with orange flesh contained 18.7mg of β -carotene (/100g fresh weight basis), a value comparable to that of U.S. cultivars (Fig.). The average retinol equivalent



of some cultivars (Resisto, Benihayato, Santo Amaro, Caromex and Red Jewel) was 2.8, which corresponded to the maximum value recorded in carrot cultivars. However, no

carotenoids were detected in the cultivars with yellowish-white flesh.

Reference: Y. Takahata et al., *Japan J. Breed* **43** (3): 421-427 (1993).

Reader's Talk

Letters to the Editor

For the Establishment of a World Center for Sweetpotato Research !

Tomonori Nagahama

**Faculty of Agriculture,
Kagoshima University**

The first issue of SPORF has just come out and been distributed to those concerned all over the world. I would like to congratulate the editors.

The National and the respective Prefectural Experiment Stations in Southern Kyushu

have been working on sweet-potato for many years and have obtained substantial results. Our predecessors were, however, somewhat, I think, too humble to report their outstanding achievements overseas.

Recently, researchers have been developing new promising cultivars characterized by valuable components and suitable texture for table and processing uses, in addition to the more advanced high starch cultivars. Their diverse products have also been accepted by the consumers, in addition to the progress of basic

studies in related fields. These cooperative efforts should contribute to the alleviation of the problems confronting sweetpotato researchers.

As one of the university faculties working on sweet-potato chemistry, I strongly hope that SPORF will disseminate the most advanced information on sweetpotato technology worldwide.

And I also hope that this publication will eventually pave the way for the establishment of a World Center for sweetpotato research in the near future.

Contribution to Letters for the Editor in SPORF are welcome. Please address all correspondence concerning editorial matters to SPORF editor.

Announcements

Sweetpotato group conference in BRP will be held in January 1996

Sweetpotato Group Conference in Integrated Research Program for Effective Use of Biological Activities to Create New Demand (Bio-Renaissance Program, BRP) will be held on January 22-23, 1996 at Nishigoshi Campus of Kyushu National Agricultural Experiment Station in Kumamoto, Japan.

The conference will be introduced up-to-date results on sweetpotato breeding, cultivation, processing and utilization as food. In addition, lectures on marketing strategy of new goods are planning.

For further information, contact : Osamu Yamakawa, SPORF editor.

Send your Calendar Events, Announcements, and News about your Department, Organization, or Company to SPORF Editor.

Editor's note

Want for it, and you will get it.

First of all, we'd like to say "thank you" to all the sweetpotato researchers working at Kyushu National Agricultural Experiment Station for their first issue of SPORF. To start new events is hard, but to continue them is more hard. We expect hereafter your cooperation to go along this way.

I respect sweetpotato which has great possibility, and I shame myself who can't still use this plant effectively. Help wanted ! (O.Y.)

Subscription to SPORF is **free**. Those who are interested in receiving this publication may write to SPORF editor.



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