

Sweetpotato Research Front

Kyushu National Agricultural Experiment Station (KNAES)

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Report on the 11th Research Meeting for Root Crops held in Miyazaki Prefecture

Osamu Yamakawa

Chief of Sweetpotato Breeding Lab., KNAES



Dr.M.Ono(right), who is a specialist of home economics, is from Nagoya Women's University.

The 11th research meeting for root crops was held from December 4 to 5, 1997 in Miyazaki Prefecture. More than 70 researchers engaged in research on sweetpotato and potato gathered to exchange information on the results and plans of their 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-129 and Kyushu-130 show a good taste and good shape for table use, especially,

Kyushu-129 has an excellent taste in spite of a comparatively low yield. Kyushu-131 with a high carotene content and Kyushu-132 with high anthocyanin content were selected for processing. Both lines display high adaptability for direct planting.

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

3. Eight short research topics were presented as follows: 1) Promising cultivars for utilizing sweetpotato tops. 2) Research plans for developing sweetpotato cultivars with low amylose content by biotechnological procedures. 3) Varietal differences in retrogradation of gelled sweetpotato starch. 4) Drying method of sweetpotato roots with high quality by rotary dryer. 5) Varietal differences in the traits of gelled sweetpotato starch. 6) Development of purple sweetpotato paste derived from a cultivar "Ayamurasaki." 7) Elimination of superoxide activity by sweetpotato juice. 8) Estimation of vitamin and mineral contents in sweetpotato roots.

Research Paper

Effect of Cultural Conditions on Anthocyanin Content of Purple-Colored Sweetpotato

Tooru Kobayashi, Hiroki Ikoma and Hideyuki Mochida*
Laboratory of Crop Production Management
*Research Project Team 2

“Ayamurasaki” is a newly released cultivar with a high anthocyanin content. Since it is used for processed food (for example, juice, paste and powder), a high anthocyanin content is required to obtain a raw material with a high quality. However the effect of cultural conditions on the anthocyanin content in the flesh has not been well documented. This paper describes the relationship between the anthocyanin content and soil temperature.

Field experiments were carried out at the Kyushu National Agricultural Experiment Station in Miyakonojo from 1994 to 1997. The cut-sprouts were transplanted from May to July and the storage roots were harvested from September to November each year. Anthocyanin content (color value) was measured by absorbance at 530 nm. Soil temperature was measured at 20 cm underground.

The relationship between the time of planting and anthocyanin content (1996) is shown in Fig.1. The roots harvested in November showed a higher antho-

cyanin content than the September ones. These results which were also confirmed in other years suggest that the storage roots harvested at a later time contained a higher level of anthocyanin. On the other hand, compared with the same planting period, the late-planting storage roots displayed a higher anthocyanin content than the early-planting ones. These results indicate that the anthocyanin content is mainly influenced by the planting time rather than the growth period, suggesting that the change of the anthocyanin content may be due to the soil temperature. The relationship between the average soil temperature and the anthocyanin content during the period of tuber growth is shown in Fig.2. A highly negative correlation was observed significantly, indicating that the soil temperature is one of the important factors for the change in the anthocyanin content in storage roots.

These results suggest that control of the soil temperature may lead to an increase in the anthocyanin content in the roots of purple-colored sweetpotato.

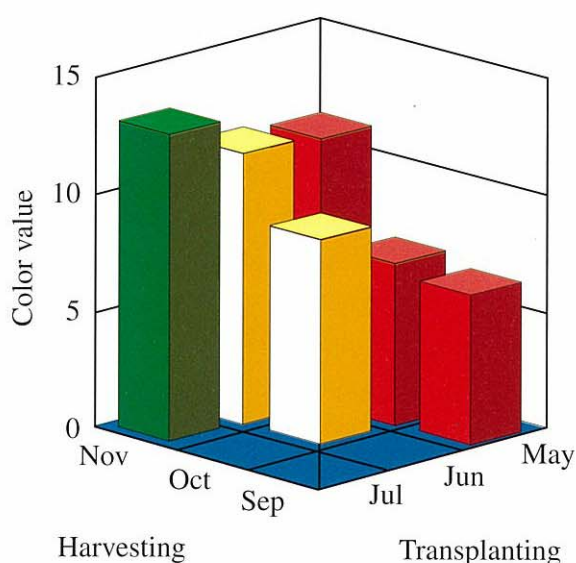


Fig.1 Relationship between the time of planting and anthocyanin content (1996)

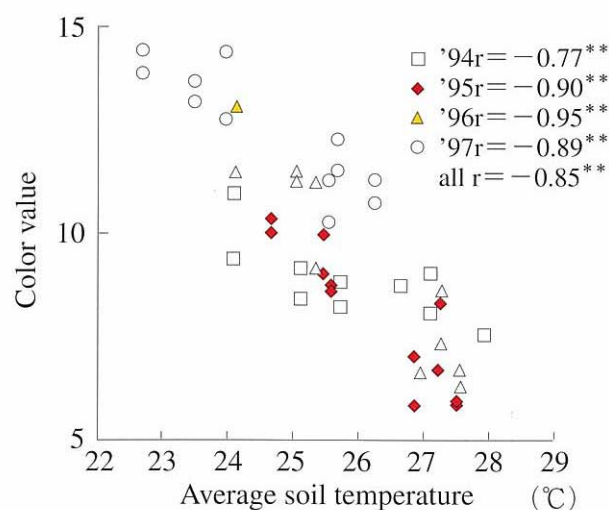


Fig. 2 Relationship between the average soil temperature and anthocyanin content during the period of tuber growth

Research News

Report on International Workshop on Sweetpotato Production System toward the 21st Century

The international workshop on sweetpotato was held from December 9 to 10, 1997 in Miyakonojo city, Japan. Approximately 100 researchers from 10 countries, in which sweetpotato is produced and one international organization (CIP), presented 27 reports in 5 sessions with a view to developing systems of sweetpotato production toward the next century.

Special lectures

1. Development of New Cultivation and Utilization System for Sweetpotato toward the 21st Century: Dr. O. Yamakawa, Japan
2. Sweetpotato Breeding Strategy of CIP: Dr. Il-Gin Mok, CIP

Session 1 Problems and subjects of sweetpotato production and utilization of the countries

1. Production and Utilization of Sweetpotatoes in the United States: Dr. Don R. LaBonte, USA
2. Commercial Sweetpotato Production in New Zealand: Foundations for the Future: Dr. Steve Lewthwaite, New Zealand
3. Sweetpotato Production and Utilization in India -Problems and Prospects-: Dr. P. Kamalam, India
4. Status, Problems and Future Direction of Sweetpotato Production and Utilization in Philippines: Dr. Gerry Mariscal, Philippines
5. Problems and Subject of Sweetpotato Production and Utilization in Indonesia: Dr. Muhammad Jusuf Yakub, Indonesia
6. Sweetpotato Production, Utilization and Research in Malaysia: Dr. Kok Chee Mooi, Malaysia
7. Sweetpotato Production and Research in Vietnam: Dr. Vu Dinh Hoa, Vietnam
8. Sweetpotato Production, Utilization and Research in China: Dr. Ma Daifu, China
9. Production and Utilization of Sweetpotato in Korea: Dr. Young Sup Ahn, Korea
10. Present Status and Future Aspect of Sweetpotato Production and Consumption in Japan: Dr. K. Komaki, Japan

Session 2 Breeding Technologies

1. Sugar-, Stress- and Jasmonate-Inducible Gene Expression in Sweetpotato: Dr. K. Nakamura, Japan
2. Transformation by Direct Gene Transfer in Sweet-

potato (*Ipomoea batatas* L. (Lam.): Dr. T. Murata, Japan

3. Molecular Markers in Hexaploid Sweetpotato: Dr. Don R. LaBonte, USA
4. Breeding of Purple Fleshed Sweetpotato: Dr. M. Yoshinaga, Japan

Session 3 Production management system

1. Towards Efficient Micropropagation, Cutting Propagation and Transplant Production of Sweetpotato (*Ipomoea batatas* (L.) Lam.) under Artificial Light in Closed Ecosystems: Dr. T. Kozai, Japan
2. Micropropagation and Virus Indexing in the North Carolina Foundation Seed Program Improves Sweetpotato Yields and Quality: Dr. Jonathan R. Schultheis, USA
3. Sweetpotato Production using the Nutrient Film Technique (NFT): Dr. Conrad Bonsi, USA
4. Present Status and Future Trends of Mechanized Farming for Sweetpotato: Dr. H. Fukazawa, Japan

Session 4 Processing and circulation technologies

1. Sweetpotato Chemistry in Relation To Health: Dr. Stanley J. Kays, USA
2. Sweetpotato as Material for Functional Food: Dr. M. Yoshimoto, Japan
3. Sweetpotato Starch: Its Properties and Utilization in Japan: Dr. T. Suganuma, Japan
4. Investigation of Sweetpotato Processing in Kagoshima Prefecture: Dr. Y. Tamaru, Japan
5. Characteristics of Pigments Derived from *Ayamurasaki* as a Food Color: Dr. K. Odake, Japan

Session 5 Environmental preservation and the social impacts of sweetpotato production

1. Possible Input of N₂-derived Nitrogen in Sweetpotato: Investigation by d¹⁵N Dilution Method: Dr. T. Yoneyama, Japan
2. Integrated Control of Sweetpotato Weevils, *Euscepes postfasciatus* and *Cylas formicarius* (Coleoptera: Curculionidae): Dr. K. Yasuda, Japan
3. Prospects and Problems in Managing Sweetpotato Diseases: Dr. Chris Clark, USA
4. Recent Changes in the Cultural Position of Sweetpotato in Kawagoe, Saitama, Japan: Prof. B. Duell, Japan

Research News

Based on the above-mentioned research information and discussions about the research strategies at the workshop, the following orientation was recommended to promote international collaboration toward the next century:

I. Establishment of international network by using the Internet among sweetpotato researchers

We should establish an international network among sweetpotato researchers by using the Internet to promote the exchange of information and any possible collaboration in sweetpotato research. Efficient methods will be explored for exchanging information with researchers having limited or no Internet access. We expect that CIP or ISTRC could play a leading role in the international network of sweetpotato researchers. Kyushu National Agricultural Experiment Station in Japan (KNAES) will contribute to the establishment of such a network by providing server resources.

II. Development of postharvest utilization of sweetpotato

- 1) Characterization and improvement of the starch properties of cultivars and processing technology (small and large scale) including starch and flour processing to utilize starch properties efficiently.
- 2) Development of high value products from sweetpotato (roots and tops) with a high acceptability for consumers, i.e., having good taste and flavor, high nutritional value, and physiological functions (breeding methods will be developed for these purposes).
- 3) Alleviation of postharvest problems, especially control of postharvest diseases.
- 4) Determination of the critical physical and chemical factors controlling the acceptance of sweetpotato by consumers.

III. Development of production systems of sweetpotato

- 1) Integrated management for weevil including breeding of resistant varieties using biotechnology, development of biological control.
- 2) Integrated management of sweetpotato diseases including the development of diagnosis systems and biological control.
- 3) Development of efficient system of propagation that can prevent the spread of virus diseases including systems of micropropagation or direct planting and investigations on the detection and identification of sweetpotato viruses.
- 4) Development of soil management systems for achieving both productivity and environmental preservation including diagnosis systems of soil fertility for sweetpotato production and physiological status of sweetpotato plant.

IV. Development of fundamental technology

- 1) Continuous exploration, evaluation and exchange of genetic resources, development of *in vitro* preservation techniques and other basic technologies relating to genetic resources for the establishment of a regional gene-bank.
- 2) Development of molecular techniques for the identification of genotype and for the evaluation of the relationship between genotypes or genetic diversity of genetic resources including related wild species.
- 3) Development of molecular technique for transformation, isolation of useful genes and control of gene expression.
- 4) Physiological investigations for the development of production, postharvest and molecular technology.

The proceedings of this workshop will be issued soon.



Research News

Laboratory of Farm Management (Nishigoshi)

We carry our studies on farm management relating to various farming systems in Kyushu district.

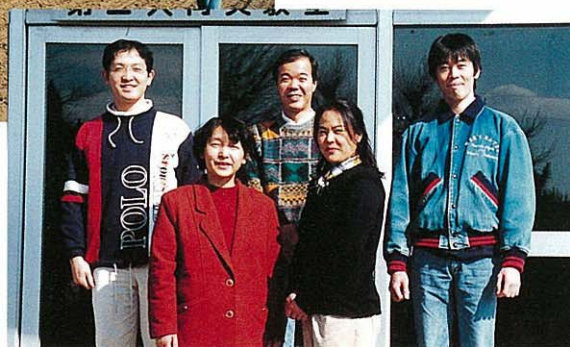
The research subjects relating to sweetpotato in our laboratory are as follows.

(1) Evaluation of sweetpotato harvester based on a model for optimum rate of harvesting operations in agricultural cooperatives.

(2) Evaluation of new technologies, such as direct planting and new cropping systems of sweetpotato based on a model.



Study on harvesting hours



Members of the Laboratory of Farm Management

Associate Director for Upland Crop Production (Miyakonojo)

The post was newly created in Oct. 1996 to promote the upland crop production in the Kyushu region. As the first associate director in the department, I am in charge of research on the improvement of upland crop production and coordination of research work. At present, heavy work and low cost-performance are critical problems to address in order to improve in upland crop production. Diversification of upland crop production including sweetpotatoes, efficient cultivation systems and new utilization methods are required to promote the upland agriculture in Kyushu.

Research covers mainly two aspects; I. Development of propagation method of sweetpotatoes, using small cubes obtained by cutting tuber roots. This method is simple and could be applied for the

mechanization of transplanting. II. Studies on the formation of root system of sweetpotatoes. They build an unique root system for active uptake of nutrients and water.



Plantlets obtained from sweetpotato cubes.

Reader's Talk

Letter to the editor

Kawagoe Friends of Sweetpotatoes

Barry Duell

Professor, Tokyo International University*

The Kawagoe Friends of Sweetpotatoes began in 1984 as a citizen group to better understand sweetpotatoes. We were proud of our city, Kawagoe, and its entrenched sweetpotato image. But, that image was not good, so we set out to improve it.

Besides learning about the history of sweetpotatoes, how they are grown, and so on, the Friends

decided to have fun with sweetpotatoes to even better appreciate them. Subsequently, we held cooking classes to learn interesting ways to consume our favorite crop, we started a small festival to celebrate Kawagoe's leading image, and we even had a "haiku" poetry contest to praise all aspects of the humble tuber.

Perhaps the Friends' dream was achieved. Interest in our activities spread far beyond Kawagoe. Even better, Kawagoe's sweetpotato image has come to be viewed positively. But, the Friends are no longer very active. However,

many of its members were launched by Friends activities to do bigger and better things with sweetpotatoes.

Do visit Kawagoe and meet the Friends running the Sweetpotato Museum, restaurants serving a variety of sweetpotato dishes, shops offering sweetpotato confectioneries and snack items, and so on.

*1-13-1 Matoba-kita, Kawagoe, Saitama 350-1197, Japan
FAX: +81-492-32-1119
E-mail: bduell@tiu.ac.jp

Announcements

Here, we introduce the STA Fellowship Program for the SPORF members who wish to carry out collaborative studies with the sweetpotato research members at KNAES. The Science and Technology Agency (STA), an administrative organ of the Government of Japan, established the STA Fellowship Program in order to offer opportunities for outstanding young foreign researchers in the field of science and technology to conduct research at Japan's national laboratories, etc. For long-term fellowship, each applicant should: 1) Possess a doctor's degree in a scientific, technological, engineering or medical field, or have an equivalent qualification; 2) Be less than 35 years of age, in principle; 3) Be in good health to pursue research activities in Japan; 4) Have an adequate language ability to pursue research activities in Japan. Japanese language ability is preferable, but English is sufficient. For further information (round-trip airline ticket, monthly living allowance, etc.), please contact: Osamu Yamakawa, SPORF editor.

Editor's note

At the beginning of this year very good news popped up before us. MAFF granted special award to our sweetpotato research works for the development of new food products made from sweetpotato rich in carotene or anthocyanin as the best three superior accomplishments in 1997. Various kinds of physically functional food producing by processing sweetpotato will appear in the market this year. (O.Y.)

Editorial Staff

Editor

Osamu Yamakawa

Coeditors

Yoshikuni Masaoka

Ikuo Suda

Akihiro Yamashita

Makoto Yoshimoto



Sweetpotato Research Front (SPORF)

Address : Department of Upland Farming, Kyushu National Agricultural Experiment Station, MAFF, Miyakonojo, Miyazaki 885-0091, JAPAN

E-mail: osamu@mykz.affrc.go.jp

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