

NUTRITIONAL AND THERAPEUTIC PROPERTIES OF INDIGENOUS PADDY VARIETIES (IPVs)

Final Progress Report of the project implemented by the Centre for Indian Knowledge Systems (CIKS), Chennai, INDIA for the period November 2013 to September 2014 (Ref. SED a@k 2013CIKS)

I. Survey of Modern Technical Literature

This survey was undertaken directly by the CIKS Team in Chennai based on our library resources and internet searches. A detailed report of the progress is given in Annexure – 1 which includes the following documents.

- An Annotated Bibliography with 46 key references which contains mention and descriptions of indigenous paddy varieties (Doc.1)
- A list of ten institutions which were identified as agencies working on or knowledgeable in this area (Doc.2)
- A tabulation of 303 names of indigenous paddy varieties wherein we have listed for each variety the – name, geographical locations, duration, colour, therapeutic value and the reference number (Doc.3)
- A listing of certain books, articles and series of publications that have been identified and need to be studied – 79 items listed (Doc.4).

Given below are a few examples that illustrate the kind of properties that are found in the literature.

1. Bhama – this is a red rice variety from Chhattisgarh and Jharkhand very highly valued by the Tribals for the stamina that it provides.
2. Bhajly – a variety from Chhattisgarh and Bihar that is given to lactating mothers.
3. Kala jira – from Koraput district of Orissa eaten during the spring time – an aromatic variety that provides great strength.
4. Lohitaka – a red rice variety with excellent medicinal properties which is good for eye sight, cooling to the body and a tonic.

II. Survey of Tamil Literature

This was also undertaken as an exercise by the CIKS team. A detailed documentation has been carried out and given as Annexure – 2 containing the following.

- An Annotated Bibliography from Tamil sources containing 48 entries (Doc.1)
- A table containing names of 350 paddy varieties listing for each variety the name, duration, season and colour, therapeutic value along with the reference. (Doc.2)
These entries include several varieties that are referred to in multiple references. 36 names are referred to in 2 sources, 12 names in 3 sources, 4 names in 4 sources and 1 name is found in 6 sources.

A few illustrations are given below.

1. Annamazhagi – used to cure fevers and body heat.
2. Kalanamak – a salt tolerant black variety with a use for skin diseases and blood pressure. Traditionally consumed by Buddhist monks.
3. Karuthakar – regular consumption cures piles. Also used for control in diabetics.
4. Kattuyanam – useful in controlling diabetics – specific procedures for use mentioned.
5. Kodai samba – cures Vatha related diseases.

III. Survey of Literature from Ayurvedic Medical Texts

The Foundation for Revitalization of Local Health Traditions (FRLHT), Bengaluru was identified as the partner agency to undertake this survey. The scope of the work in terms of information to be collected is listed below.

1. What are the general properties and nutritional and therapeutic qualities of rice in general that are described in Ayurveda texts.
2. Names of specific varieties as well as their properties.
3. Use for treatment of humans, animals and also plants.
4. Various parts of paddy plant and their uses including – straw, bran etc.
5. Methods of use other than consuming as food such as – external application, fomentation etc.
6. Information regarding properties and uses of rice cultivated in different seasons, different kinds of land or by various methods (direct sowing, transplantation etc.)
7. Types of preparations of rice and their qualities – cooked rice, kanji, fermented preparations etc.

8. Differences in methods of processing – raw rice / parboiled rice, hand pounded rice etc.

A draft report was submitted by FRLHT carrying information based on material collected from texts of Ayurveda as well as Pakasastra. A revised form of this report was submitted which is given in Annexure – 3 which contains the following information.

- Ayurvedic classification of paddy varieties
- A set of tables listing properties of various groups of rices identified in Ayurveda, application of these rice groups to various disease conditions, physiological effects of rice based on various factors etc.
- Table – 4 lists the rice varieties mentioned in the Pakasastra texts Bhojana Kutuhalam
- Table – 5 lists the medicinal properties of rices processed in different ways.
- Towards the end there is a set of references after which in the last part is a note on various texts of Ayurveda that have been surveyed.

A few of the highlights are given below.

1. Rice is divided into four broad groups known as – Sali, Vrihi, Shashtika and Nivera and for each of them there are descriptions of qualities and effects of Doshas based on Ayurvedic terminology.
2. The utility of each of the above types of rice in various disease conditions is described. For example, Sali rices are useful in diarrhea, Rakta sali (red variety of Sali) are valuable in pregnancy etc.
3. The physiological effects of rice varies based on how it is cultivated and stored. For example, rice grown in dried regions are light to digest while those grown in wet regions are heavy to digest. Similarly new rice (freshly harvested) is said to be Aphrodisiac whereas old rice (milled after storing for at least a few months) is said to be light to digest.
4. Medicinal properties of rice processed in different ways are described. For example, puffed rice is said to be light to digest and useful in vomiting and diarrhea whereas boiled rice stimulates the digestive capacity and is wholesome.

IV. Survey of literature from Siddha Medical Texts

The Centre for Traditional Medicine and Research (CTMR) based in Chennai was identified as the expert agency to undertake this work. The following were the set of questions identified for information to be gathered from Siddha medical texts and interviews with Siddha practitioners.

1. What are the general properties, nutritional and therapeutic qualities of rice in general that are described in Siddha texts.
2. Names of specific varieties as well as their properties.
3. Use for treatment of humans, animals and also plants
4. Various parts of paddy plant and their uses including – straw, bran etc.
5. Methods of use other than consuming as food such as – external application, fomentation etc.
6. Information regarding properties and uses of rice cultivated in different seasons, different kinds of land or by various methods (direct sowing, transplantation etc.)
7. Types of preparations of rice and their qualities – cooked rice, kanji, fermented preparations etc.
8. Differences in methods of processing – raw rice / parboiled rice, hand pounded rice etc.

A meeting was held with the CTMR and the first draft of the report was produced and discussed. Based on the feedback a revised draft has been submitted by them. This document is reproduced as Annexure – 4 and the contents are summarized under the following sections.

- An introductory section about the health benefits of paddy and rice.
- A note on the sources of information i.e., the basic texts of Siddha medicine.
- A listing of 32 paddy varieties whose names are found in the Siddha text.
- The major section wherein the list of paddy varieties is given along with the information regarding each variety as it is found in the Siddha texts – the original Tamil words is given along with the transliteration in English and a summary translation in Tamil.

- In the later part for this report a set of rice based products and dishes are listed (such as raw rice, parboiled rice, rice flour, puffed rice, etc.) with translations and transliterations of the material from Siddha texts.
- The set of references is given towards the end.

A few illustrations are given below from the report.

1. The Annamazhagi variety of rice regulates Pitha diseases.
2. The Karunkuruvai variety is dark in colour and used in the treatment of skin diseases and poisonous stings and bites.
3. Gundu samba is used to treat indigestion and skin diseases.
4. Parboiled rice – is obtained by boiling paddy and then drying and milling it – this is popular in Southern districts of Tamil Nadu and the Kerala State. This is highly recommended for strength during convalescence from diseases and for children for healthy growth.

V. Identification and collection of paddy varieties from the field

A survey was undertaken with groups and communities of farmers with whom our centre has been working in various districts of Tamil Nadu. Based on this survey we have currently collected samples of 40 varieties of paddy that can be subjected to experimental and laboratory testing. Further, we have information about 15 additional varieties which we can access if we decide to take up a detailed investigation with any of those varieties. It was finally decided that eight indigenous paddy varieties would be taken up for study, namely - Karunkuruvai, Mapillai samba, Kudaivazhai, Kalanamak, Perungkar, Kovuni, Kullakar and Neelam Samba.

VI. Laboratory Tests – Collaboration with Ethiraj College for Women, Chennai

Based on a preliminary discussion and assessment with various laboratories and academic institutions it was decided to enter into a collaboration with Ethiraj College for Women in Chennai. The major considerations were the following –

1. The College has active research departments on the subject of nutrition and also allied areas such as biochemistry and chemistry.
2. The College offers post graduate courses in these subjects and has a large student body.

3. We were able to identify a staff member who was keen and enthusiastic to collaborate with sufficient technical knowledge.

Collaboration with Ethiraj College for Women, Chennai

CIKS entered in the collaboration agreement for research along with Ethiraj College for Women, Chennai. On 2nd July 2014, at a function held at the College A.V. Balasubramanian representing CIKS and Mr. V.K. Muralidharan, Chairman, Ethiraj College signed an MoU at a function attended by the Principal and Faculty of Depts. of Nutrition and various other divisions of the College. The collaboration would focus on food and nutrition. During the event A.V. Balasubramanian made a presentation to the staff and faculty on - "Nutritional and Therapeutic Properties of Indigenous varieties of Paddy and Vegetables : the need for a study". As per the MoU the Principal Investigator for the project was Mrs. M. Menaka, Assistant Professor, Department of Clinical Nutrition and Dietetics while the Co-Principal Investigator was Dr. Mrs. Girija Shyamsundar, Associate Professor and Head, Department of Nutrition, Food Service Management and Dietetics. The work was carried out during the period July and August 2014.

COMPONENTS OF THE WORK AND DESIGN

A. Objective of the study

The study analysed the physico chemical properties, nutrient value and standardized and evaluated the acceptability and tested the Glycemic Index of the eight organically grown traditional / indigenous rice varieties. The varieties were - Karungkuruvai, Mapillai samba, Kudaivazhai, Kalanamak, Perungkar, Kouni, Kullakar and Neelam Samba. The properties of these varieties were compared with respect to the modern rice variety White Ponni which was used as a control.

Study design

The study was carried out in a – “Double Blind” manner. Neither the student volunteers and researchers nor the investigators knew the identity of the samples. They were provided a set of 10 samples of which the first sample (CIKS No.1) was White ponni and the other nine samples (CIKS No. 2 – CIKS No. 10) were coded samples of the eight indigenous varieties of which one was a replicate.

Specific Objectives of the study

1. To check the physicochemical properties of organically grown indigenous rice varieties
2. To analyze the nutritive value of organically grown indigenous rice varieties
3. To formulate and standardize a recipe based on organically grown indigenous rice varieties
4. To test the acceptability of organically grown indigenous rice varieties
5. To check and compare the glycemic index of organically grown indigenous rice varieties with white ponni, white bread and glucose as control.

Approval by Ethics Committee

As per the research methodology guidelines, an Ethics committee was formed which included a nutrition expert, a medical doctor, sociologist and a lawyer as members. The committee approved the design of the study looking at ethical considerations.

Findings of the study

A detailed report of the study is provided as Annexure – 5. This includes an introduction, description of methodology, materials and methods, results and discussions followed by summary and conclusion. The study also includes a bibliography of references and a set of four appendices that describe in detail the methodology employed for various investigations.

Highlights of the study

The highlights of the study are provided in the accompanying tables. Some of the key findings are

1. The variety Karunguruvai which is highly valued by the Siddha physicians has a high content of protein, fat and phosphorous.
2. The variety Neelam samba has the highest content of Calcium and it is interesting that this is recommended as the variety of choice for pregnant women and lactating mothers.
3. Kalanamak which has a high amount of potassium is recommended for high blood pressure.

4. Mappillai samba which is recommended for strength and stamina has the highest amount of carbohydrates as well as crude fiber.
5. In terms of the Glycemic Index (GI) it is seen that all indigenous varieties have a GI that lower than the modern variety.
6. When the GI of the indigenous variety is compared to the modern variety White Ponni, on a scale when the GI of White Ponni is 100, it was found that the GI of Kullakar, Kovuni, Karungkuruvai and Kalanamak are in the range 50-55 while Mapillai Samba and Kudaivazhai are in the range of 66 - 70.

Nutrient Content of Organically Grown Indigenous Rice Varieties

S. No.	Nutrients	Units	White Ponni	Karung kuruvai	Mappilai Samba	Kudaiavzhai	Kalanamak	Perungkar	Ku vaz
1.	Energy	Kcal/100g	351.32	358.56	358.52	358.94	356.68	357.54	357.54
2.	Carbohydrate	g/100g	77.85	77.85	80.28	79.7	78.53	76.88	76.88
3.	Protein	g/100g	9.06	9.45	7.18	7.92	8.93	9.58	8.93
4.	Fat	g/100g	0.92	1.04	1.0	0.94	0.76	1.3	0.92
5.	Crude fibre	g/100g	1.48	1.49	7.07	1.16	1.42	1.4	1.48
6.	Calcium	mg/100g	80.63	77.09	50.82	54	63.55	57.14	57.14
7.	Iron	mg/100g	4.25	19.63	5.47	6.13	3.84	7.64	4.25
8.	Potassium	mg/100g	94.23	83.85	90.39	80.17	98.82	93.98	93.98
9.	Sodium	mg/100g	BDL (DL:10)	BDL (DL:10)	BDL (DL:10)	BDL (DL:10)	BDL (DL:10)	BDL (DL:10)	BDL (DL:10)
10.	Phosphorus	mg/100g	264.04	350.59	310.92	274.73	318.10	264.77	264.77

Rice	Mean GI (With glucose as control)
Karungkuruvai	53.81
Mappilai Samba	68.84
Kudhaivazhai	66.34
Kalanamak	50.71
Perungkar	75.84
Kovuni	52.36
Kullakar	52.25
Neelam Samba	84.37

VII. Workshop on Nutritional and Therapeutic Properties of Indigenous Paddy Varieties

On 21st August a one day workshop was organised in Chennai to share the results of the workshop and discuss the findings. It was attended by a group of about 40 persons including - project partners, scientists from the Central Food Technological Research Institute (CFTRI), Mysore, Council for Scientific and Industrial Research (CSIR), Govt. of India, practitioners of Ayurveda and Siddha systems of Medicine, representatives of farmers groups, civil society organisations involved in conservation of agrobiodiversity and students and faculty from Departments of Nutrition. The meeting deliberated upon the findings of the project and discussed the possible follow up activities that may be taken up. A report of the workshop is provided in Annexure – VI.

VIII. Presentations and Discussions

An effort was made to meet a cross section of Scientists and have discussions with groups to identify agencies and individuals who may be interested in developing this work. A few of these initiatives are listed below.

A. Visit to the Central Food Technological Research Institute (CFTRI), Mysore

On 25th July A.V. Balasubramanian and K. Vijayalakshmi visited the CFTRI, Mysore. During the visit A.V. Balasubramanian made a presentation on - "Nutritional and Therapeutic Properties of Indigenous varieties of Paddy and Vegetables : the need for a study". The presentation was attended by Scientists from the Grain Science and Technology (GST) and several other divisions of CFTRI. Following this they also visited the workshop of GST division and the exhibition relating to the technologies and products developed by CFTRI.

B. Talk at the Madras Diabetes Research Foundation, Chennai

At the invitation of the Madras Diabetes Research Foundation (MDRF), Chennai, A.V. Balasubramanian and Vijay Subbiah from CIKS visited MDRF on 4th August 2014. A.V. Balasubramanian made a presentation on - "Nutritional and Therapeutic Properties of Indigenous Paddy and Vegetable Varieties : the need for a study" to a group of scientists from MDRF which

included Dr. Sudha Vasudevan, Dr. Shobana and Dr. Kamala Krishnaswamy and others. The presentation was followed by discussion.

C. Discussions with the representatives of TATA group of companies

At the invitation of the Foundation for Revitalisation of Local Health Traditions (FRLHT), Bengaluru, A.V. Balasubramanian attended a meeting that was organised on 18th August at the FRLHT campus. The meeting was attended by Mr. R. Mukundan, Managing Director, TATA Chemicals and other representatives from the TATA Group of companies. Presentations were made and discussions were held on possible areas where research could be taken up and products could be developed that are of immediate interest to the group companies. A.V. Balasubramanian made a presentation outlining possibilities based on Vrksayurveda (Traditional Indian Plant Science) and work on Indigenous Paddy Varieties. It was agreed that follow up meetings would be held to take forward these possibilities.

D. Discussion with Scientist at the Department of Nutrition St. Johns Medical College and Research Institute, Bengaluru

On 2nd September 2014, A.V. Balasubramanian made a visit to Bengaluru for a meeting with Prof. Anura Kurpad, Head Department of Nutrition, St. John Medical College, Bengaluru. He made a presentation about "Nutritional and Therapeutic Properties of Indigenous Paddy and Vegetable Varieties : the need for a study". Also present at the discussion was Dr. Swami Subramaniam formerly of the Abbot Research Laboratories with rich experience in product development. Prof. Anura was quite interested in following up possibilities with studying paddy varieties such as *Neelam Samba* which is a potential Galactagogue. He has been studying the phenomenon of breast feeding in the context of low birth weight infants and his studies suggest that quite often breast feeding may be discontinued or tapered by the mother since the availability of breast milk is actually limited or perceived to be so by the family. Hence, he was keenly interested in products that can help in improving the availability of mother's milk.

List of Annexures

- Annexure – I : Survey of Modern Technical Literature
- Annexure – II : Survey of Tamil Literature
- Annexure - III : Survey of Literature from Ayurvedic Medical Texts
- Annexure – IV : Survey of Literature from Siddha Medical texts
- Annexure – V : Physico Chemical Properties, Nutrient Analysis, Standardization, Acceptability And Glycemic Index Of Organically Grown Indigenous Rice Varieties (Report of a study carried out by Ethiraj College for Women)
- Annexure – VI : Proceedings of the Workshop on Nutritional and Therapeutic Properties of Indigenous Paddy Varieties
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