# SESSION 3.

## Influences on Nutrient Composition: Biological, Biodiversity, Physical Environmental, Processing and Biotechnology

S3-S-1

# Nutrition Indicator for Biodiversity Related to Food Composition

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FAO in collaboration with Biodiversity International are leading the Cross-cutting Initiative on Biodiversity for Food and Nutrition which has been established to measure, investigate and promote biodiversity and nutrition. Therefore, nutrition indicators need to be developed to address the three dimensions of biodiversity - ecosystems, the species they contain and the genetic diversity within species. The first nutrition indicator for biodiversity is related to food composition and was developed in 2007 at an Expert Consultation in Brazil. It aims to report the annual progress regarding availability of food composition data for biodiversity by counting the number of foods with at least one component and with sufficient detail in the description and taxonomic name. In 2008, baseline data were collected by FAO in collaboration with INFOODS: about 4,700 foods were counted for the indicator worldwide out of which 2,400 foods were published in user databases. Most data on food composition counting for biodiversity are found in Asia (2,200 foods), followed by Africa (840 foods), Oceania (620 foods), America (551 foods), Europe (188 foods) and the BASIS database with 300 foods. Most of these foods are wild, underutilized or indigenous (for which taxonomic names at species level are sufficient) while few foods have compositional data on variety, cultivar or breed level. New data are being collected for reporting on progress in 2009 which will also be presented at the conference. It is hoped that the indicator will stimulate the production, collection and dissemination of food composition and consumption data below the species level and for wild and underutilized foods.

*Keywords:* Food composition; Biodiversity; Indicator; Baseline; GEF

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S3-O-2

# Cultivar Differences and the Effect of Processing on the Nutrient Composition of Rice

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Rice is cultivated in more than 100 countries around the world and is a staple for about half the world's population. Rice provides 27% of dietary energy supply, 20% of dietary protein and 3% of dietary fat besides significant amounts of B-vitamins and minerals. In the past generic food composition data were considered sufficient for most purposes but today the importance of cultivar specific composition data is being increasingly recognized especially to combat malnutrition. Therefore this study was initiated to obtain cultivar specific nutrient data of Indian rice that is grown in different ecological zones and to study the effect of processing on the nutrient composition. Proximate composition, minerals (Fe, Zn, Cu, Mn, Mg, Ca, P) vitamins (B1, B3) and phytate content in 250 rice cultivars comprising of 750 samples in the form of brown rice, 5% polished and 10% polished rice were studied. Except moisture content, all the nutrient parameters studied showed significant reduction due to polishing. The mean±SD of protein content (n=250) was 10.2±1.33 g/100 g in brown rice. Fat content ranged from 1.9 to 4.3 g/100 g with a mean± SD of 2.39±0.55 g/100 g in brown rice which decreased considerably to 1.08±0.39 g/100 g at 10% polishing due to the removal of the bran. Fat content in rice bran ranged from 11.57 to 18.44 g/100 g. The mean±SD ash content in brown rice was 1.4±0.15 g/100 g. Decrease in the ash content due to polishing at 5% and 10% level saw a concomitant decrease in all the minerals studied. Mean±SD of iron content was 1.19±0.54 mg/100 g with 10 cultivars showing high iron content (>3 - 3.75 mg/100 g). Zinc content ranged from 1.01 to 4.15 mg/100 g with 26 cultivars showing high zinc content (>3 - 4.15 mg/100 g). Significant correlation was observed among the macro and micro nutrients studied. The data on the amino acid composition and fatty acid composition of representative samples of rice are also presented. The results clearly showed that macro and micro nutrient content of rice was clearly different among cultivars providing an opportunity to selectively breed cultivars for higher nutrient content.

*Keywords:* Rice; Nutrient composition; Cultivar; Processing

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# Physical Environmental Influence on High Iodine Intake among Saharawi Refugees in the Sahara Desert, Tindouf, Algeria

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Refugees from Western Sahara have been living in a harsh environment in the Sahara desert for more than 30 years. High prevalence of goitre and high urinary iodine excretion has been observed in the population recently. The objective of this study was to identify sources of iodine that contribute to the high excretion of urinary iodine. Various types of specimens were collected at household level: this covered drinking water (n=92), salt (n=81), local milk (camel milk n=3; goat milk n=16), urine of children aged 6-14 years (n=421), and urine of women aged 15-45 years (n=405). Iodine concentration in water and urine samples was determined by Sandell-Kolthoff reaction, whereas milk samples were performed by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). For salt, the iodine content was assessed using standard iodometric titration. Three main sources of water provided for four refugee camps. First, the water from 3 wells providing for 2 camps contained iodine ranged 55-545 $\mu$g/L; median 300 $\mu$g/L. Second, another well supplying water for 1 camp contained iodine 55-96 $\mu$g/L; median 70 $\mu$g/L. Lastly another camp consumed water purified in a reverse osmotic plant and this water contained iodine 55-127 $\mu$g/L; median 87 $\mu$g/L. Ground salt either fine or coarse contained an average iodine concentration of 11.8 $\mu$g/g (range: 0-50.8 $\mu$g/g) whereas the concentration in rock salt was 4.4 $\mu$g/g (range: 0-33.2 $\mu$g/g). Iodine in camel milk was 540 $\mu$g/L, 4,170 and 11,980 $\mu$g/L. Those in goat milk ranged from 70-13,070 $\mu$g/L with median 370 $\mu$g/L. Iodine consumption is reflected in urinary iodine excretion (UIE). The median UIE in children was 565 $\mu$g/L (range: 102-3,594 $\mu$g/L) and in women 466 $\mu$g/L (range: 54-3,640 $\mu$g/L). Huge variations in ranges of iodine concentration were observed in water and milk samples. The analysis showed that the water collected from the first three wells had unacceptable high concentrations of iodine and their consumers had significantly higher levels of UIE (children: n=207, median UIE = 885 $\mu$g/L, range: 261-3,594 $\mu$g/L; women: n=204, median UIE = 692 $\mu$g/L, range: 168-3,640 $\mu$g/L) as compared to their counterparts in other camps.

It can be concluded that water especially from the first three wells and local milk contributed to an excessive iodine intake in the refugees. Salt was an insignificant source. Physically, this environmental part of the Sahara desert may be contaminated by iodine in the water. As a result, high concentration of iodine in water affected not only camels and goats raised in this area but also residents who made use of their products.

*Keywords:* Goitre; Excess iodine; Water; Milk; Sahara desert

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# Chemical Composition of Latvian Potato Varieties Prepared with Traditional Cooking Methods Depending on Storage Period

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Rational and Objectives: Potato is one of the basic ingredients of traditional food recipes in Latvia and is a main component of warm meals. The information about chemical composition of potatoes both at ingredient and recipe level in the FCDB of Latvia is insufficient. Therefore, the aim of the research is to determine chemical composition and energy content of potatoes prepared with traditional cooking methods. Obtained results will be used for an establishment of yield and nutrient retention factors, which will be applied in a calculation of nutrient content of traditional recipes.

Materials and Methods: Five Latvian potato varieties were selected: 'Lenora', 'Brasla', 'Imanta', 'Zile' and 'Madara'. Research on potatoes was done in two periods: 1) after harvesting; 2) after 6 months of storage at temperature 5±1°C and relative humidity 80±5%. The following cooking methods were used: shallow frying (150±5°C); deep fat frying (180±5°C) and roasting in oven (210±5°C). Weight of potatoes and oil was recorded before and after frying as well as time and temperature during frying. Chemical analyses were done on the amount of total sugar, starch, fructose, glucose, sucrose, fat, protein, moisture, vitamin C, and amino acid profile. Statistical significance was set at $P<0.05$.

Results and Conclusions: Results show that the amounts of analyzed nutrients differ both among potato varieties and applied heat treatment: differences between potato varieties and heat treatment methods were determined on amount of starch, vitamin C and amino acids; whereas differences of fructose, glucose, sucrose and fat amount were discovered between cooking methods. Comparing both periods - after harvesting and after storage, energy coming from macronutrients was decreased in cooked potatoes after period of storage (in roasted potatoes by 12%, fried on the pan - 23% and deep-fat fried - 27%), which can be explained by the decrease in moisture content and changes of heat-mass transfer ratio during frying. Concerning to vitamin C, considerable losses were found after period of storage (in range 49 - 72%) as well as within cooking methods: roasting - 12-59%, shallow frying - 17-34% and deep-fat frying - 41-63%. For essential amino acids after each type of cooking methods, the highest decrease was in deep fat fried potatoes (32-52% losses) while in shallow fried potatoes - 20-31% and roasted - 4-26%.

Acknowledgments: The authors acknowledge financial support from the project Latvian State Research Program No 08-VP-9-9 and the EuroFIR consortium under the EU 6th Framework Food Quality and Safety Programme (FOOD-CT-2005-513944).

*Keywords:* Potato; Chemical composition; Energy content; Cooking; Storage

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# Effect of Feed on Nutrient Composition of Eri-Silkworm *(Philosamia ricicnii)* Pre-Pupae

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Eri-silkworms are reared on castor tree *(Ricinus communis).* Kasseru *(Heteropamax pragrans)* and tapioca *(Manihot esculenta)* leaves are an alternate food. Pre-pupae of eri-silkworm is an delicacy in North-east India. This study was conducted with the objective to find the effect of feed and season on larval growth and nutrient composition. **Materials and Methods:** Eri-silkworms were collected locally and reared until pupation on castor leaves in the laboratory. Eggs from reared adults were collected and hatched on leaves of castor, tapioca and kasseru, making three different feed groups. Larvae were reared up to fifth instar stage and two days after pupation, cocoons were opened to collect pre-pupae. Rearing was done in summer and winter months to evaluate the seasonal variation. Standard AOAC methods were used for proximate analysis, minerals and fatty acid composition. **Results:** Maximum growth rate was found in the group fed on castor leaves followed by tapioca leaves. Rapid growth was observed in summer months and required 25-30 days after hatching, as compared to 50-60 days in winter. Average proximate composition for pre-pupae was 77% water, 1.6% minerals, 5.6% fat, 10.7% protein, 2.1% total dietary fiber and 2.9% carbohydrate. Tapioca group pre-pupae had highest fat (6.4%), while kasseru group pre-pupae had highest protein (11.96%) and ash (1.76%). Proximate composition correlated slightly with composition of respective feed. However fatty acid composition of pre-pupae was in strong agreement with fatty acid profile of respective feeds. Tapioca leaves and tapioca group pre-pupae had highest linolenic acid, 11.2% and 10.6% respectively. Castor leaves and castor group pre-pupae showed the presence of ricinolic acid at 0.9% and 0.28% respectively. Palmitic acid and oleic acid were highest in Kasseru leaf at 24.4% and 68.1% respectively and were also highest in kasseru group pre-pupae. In winter, overall increase in total unsaturated fatty acid was observed in all groups. **Conclusions:** Nutrient composition of eri-silkworm pre-pupae is affected by feed and season. Fatty acid composition was clearly dependent on feed quality. Pre-pupae reared on tapioca and kasseru leaf diet are nutritionally superior as they have high mineral, protein and oleic acid content and higher n-3 to n-6 PUFA ratio as compared to pre-pupae reared on castor leaves.

*Keywords:* Silkworm; Season; Proximate analysis; Minerals; Fatty acids

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