جامعة السلطان قابوس
Sultan Qaboos University

International Symposium

on

Whole Grain Products

April 14-15, 2012

College of Agricultural and Marine Sciences

Sultan Qaboos University

Sultanate of Oman

Industrial Innovation Center

أطياب لتكنولوجيا الأغذية
AtyabFoodtech

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AGENDA

Saturday, April 14, 2012

08:30 – 09:00 am : Opening Ceremony

Session A: Promoting Whole Grain Consumption		
Session Chair: Dr. Salem Ali Al-Jabri		
09:00 – 09:30 am	Increasing whole grain consumption among school children	Prof. Marla Reicks, Professor and Extension Nutritionist, University of Minnesota, MN, USA
09:30 – 10:00 am	Whole grains in dietetics	Mrs. Wahida Mohd Saif Al-Maskari, Senior Chief Dietician , Family Health and Community Medicine, CMHS, SQU
10:00 – 10:30 am	Whole grains and mental health	Dr. Hassan Al Mirza, Department of Behavioral Medicine, CMHS, SQU
10:30 – 11:00 am	Whole grain consumption -Think beyond wheat and rice	Dr. Ehsan Abbas Elshafie, Post-Doctoral Researcher, SWAE, CAMS, SQU
11:00 – 11:30 am	**Tea Break**	
Session B: Speciality Whole Grain Products and Sensory Attributes		
Session Chair: Dr. Mailk Mohd Al-Wardy		
11:30 am– 12:00 pm	Diet flour – Composition and functionalities	Mr. Mohib Ahmed Khan, General Manager, Atyab Food Tech LLC, Oman Flour Mills
12:00 – 12:30 pm	Use of antimicrobial compounds to preserve whole grain products	Dr. Sergey Dobretsov, Asst. Professor MSF, CAMS, SQU
12:30 – 01:00 pm	Sensory attributes of whole grain products	Dr. ZahirHumaid Al-Attabi, Asst. Professor FSHN, CAMS, SQU
01:00 – 02:00 pm	**Lunch at Faculty Club**	
Session C: Posters on Whole Grain Products – Competition for Students		
02:00 – 04:00 pm	Posters	

Sunday, April 15, 2012

Session D: Whole Grains for Disease Prevention and Treatment		
Session Chair: Dr. Mohd Shafiur Rahman		
09:00 – 09:20 am	Whole grain – The Boon and the Bane!	Dr. Siham Al Sinani, Pediatrician (Pediatric Gastroenterology), SQU Hospital
09:20 – 09:40 am	Role of whole grains in reducing the risk of chronic diseases	Dr. Amanat Ali, Associate Prof. FSHN, CAMS, SQU
09:40 – 10:00 am	Dietary fiber in whole grains and Colorectal cancer	Dr. MostafaWaly, Asst. Professor, FSHN, CAMS, SQU
10:00 – 10:20 am	Dietary fiber: Recommendations and Efficacy	Dr. LyuthaKhalfan Al-Subhi, Asst. Professor, FSHN, CAMS, SQU
10:20 – 10:40 am	Health functionality of whole grains and their main constituents	Dr. M. Mohammed Essa, Asst. Professor, FSHN, CAMS, SQU
10:40 – 11:30 am	**Tea Break**	
Session E: Whole Grains in International Food System		
Session Chair: Dr. Salim Ali Al-Rawahy		
11:30 am– 12:00 pm	Grains in agricultural systems and food of traditional communities in Northern Oman	Dr. Rashid Abdullah Al-Yahyai, Asst. Dean-TCS, CAMS, SQU
12:00 – 12:30 pm	Wheat production in Oman	Dr. Ahmed Yahya Al-Maskri, HOD, CROP, CAMS, SQU
12:30 – 01:00 pm	Whole grain products in traditional Indian Food System	Dr. E. Sukumar, Rtd. Scientist, Siddha Central Research Institute, India
01:00 – 02:00 pm	**Lunch at Faculty Club**	
Session F: Product Development with Whole Grains – Competition for Innovative Recipes		
02:00 – 04:00 pm	Food Product Display	

Increasing Whole Grain Consumption among School Children

Marla Reicks

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Whole grain intake among children and adolescents in the US has been estimated to be about one-fifth of the recommended number of daily servings. Strategies to increase intake include substituting whole grain foods for refined counterparts, revising grain products to gradually increase whole grain content and educating school food service personnel, dietitians and parents to provide additional whole grain foods in school and home meals. Nutrition education should also be provided to children as well as opportunities to prepare and taste whole grain foods as part of meals and snacks.

Whole Grains in Dietetics

Wahida Mohd Saif Al-Maskari

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Whole grain has a miraculous power in promoting heath and preventing diseases. Reflecting this conviction a variety of Government Agencies has offered Dietary Guidelines. Their recommendations are based on epidemiological studies and experimental evidence that suggest that a high fiber diet may provide protection against non- communicable diseases. Whole grain has gained its popularity in dietetics due to its physical properties. It has also important dietary sources of water – soluble, fat soluble vitamins and antioxidants. A desirable intake of whole grain could be achieved by consuming a balanced diet.

Whole Grains and Mental Health

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Whole grain products are universally advised to be part of a daily well balanced diet. Not only that these products promote physical health, but also mental health. Whole grains are sources of beneficial polyunsaturated fatty acids, among which is omerga-3 fatty acid. Omega-3 plays a role in improving mood disorders and cognition among many other benefits. Unfortunately, however, whole grain products and especially whole grain wheat can also negatively affect both physical and mental health. For example, if we take the gut brain connection, many are not aware that the neurotransmitter known as serotonin, which plays crucial role in mood regulation, is most abundant in the gut and not in the brain. Therefore, any disturbance in the gut health can lead to mood disturbances. This talk will shed light on the positive mental health effects of whole grain products in general, and the negative association between whole grain wheat and mental health in particular.

Consumption of Whole Grains – Think Beyond Rice and Wheat

Ehsan Abbas Elshafie

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Whole grains are important part of human foods, providing essential nutrients and protecting from some chronic diseases. The main two grains consumed in the daily diet of Omanis are rice and wheat and mostly in the refined form. Despite of the beneficial effects of whole grains, but there consumption in the daily diet of Omanis is low , which may be due to taste, cost, poor eating habits or unawareness about their health benefits. Whole grains other than wheat and rice such as Oats, Barley, Corn, Sorghum, Rye, Millet, Spelt, Farrow, Quinoa, Amaranth, Muesli, Teff and Kamut, contain several nutrients, different taste and different prices and may be a good option in the daily diet. People can be exposed and made aware of the health benefits of those whole grains to include them in their daily diet, beside some of them may be a good option for those having gluten allergies.

Use of Antimicrobial Compounds to Preserve Whole Grain Products

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Fungal and bacterial growth is the most frequent cause of spoilage in whole grain products. Microbial growth causes the great economic losses due to spoilage of the products and could cause numerous health problems. Usually, moisture content, the type of grain, and presence of contaminants affect the growth of microbes and different compounds and treatments are used in order to prevent it in the whole grain products. Recently, it has been found that bacteria can regulate their growth, biofilm formation, motility and virulence by the process of cell-to-cell communication called quorum sensing. During this process bacteria produce and secrete hormone-like chemical molecules in the environment. As the cell density increases, the concentration of these molecules increases, and when a given threshold concentration is reached, targeted bacterial partners can respond to these chemicals and modify their genes expression, and thus their behaviour. Inhibition of quorum sensing by chemical compounds prevents bacterial growth, motility and biofilm formation. During our study, several quorum sensing inhibitors have been isolated from plants, microbes and marine invertebrates. Some of these inhibitors, like gallic acid, naturally occur in rice and millet. Another quorum sensing inhibitor (kojic acid) reduced two-fold the densities of bacteria in the

field bioassays. Compounds that interfere with bacterial quorum sensing signals might be a good alternative to the traditional antimicrobial treatment of whole grain products.

Sensory Attributes of Whole Grain Products

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The health benefits of whole grains (e.g. wheat, rice, corn, bulgur) reported include; reduce the risk of overweight, type 2 diabetes, cardiovascular disease and certain cancer. Therefore, several kinds of products are available in the market as a whole grain such as bread, oatmeal, rice, whole grain cookies and whole wheat crackers. However, consumers tend to select their foods primary on the sensory properties (e.g. appearance/color, smell, taste, texture) of that product. Researchers found that appearance, taste and texture were affecting the overall acceptance and consumption of whole grain products. The effects of sensory quality on the perception of school children's, parents and staff as well as the general consumers are published. The low acceptance of whole grain products made of whole wheat flour is related to the bitter taste. On the other hand, the acceptance of whole grain products by school children is affected by the dark color and coarser texture. Modifying these attributes could significantly increase the preference of these products. Cooking and storage conditions are affecting the sensory attributes of whole grain products as well as using irradiation and microwave processing technology. Using non thermal technology i.e. hydrostatic pressure improved the color, flavour and texture of cooked rice. The effect of using extrusionon whole grain products is

also reported. Generally, the sensory attributes playing an important role in accepting or rejecting the whole grain products.

Dietary Fiber in Whole Grains and Colorectal Cancer

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The high increase in incidence of colon and rectum (colorectal) cancer represents a global burden in developed and developing countries. Despite the continuous advances in colorectal cancer treatment and early diagnosis, yet it affects large number of people of all social classes indicating a common etiological factor as being the trigger for colorectal cancer incidence. Recent studies have revealed that high intake of dietary fiber plays an important role in reducing the risk of colorectal cancer. There is robust evidence from cross-sectional and longitudinal studies supporting the notion that whole grains consumption represents a good source for dietary fiber. The protective effect of high intake of dietary fiber against colorectal cancer is mainly due to two major mechanisms; firstly dietary fiber decreases fecal transit time so it diminishes the exposure time to toxins present in the fecal excretion. Secondly, dietary fiber adsorbs stool toxins thus protecting the colonic epithelial cells from such toxins. The objective of this study was to evaluate the dietary pattern of patients newly diagnosed with colorectal cancer. A case-control study included 220 recently diagnosed colorectal cancer patients and 220 age and gender matched healthy subjects as a control group. The participated colorectal cancer patients had lower dietary intake of fiber as compared to controls, < 5 gm/day. The frequency of consumption of whole grains was lower among colorectal cancer patients when compared to controls,

P<0.05. Family history for CRC played a positive role in increasing the colorectal cancer risk and the majority of colorectal cancer patients had a low physical activity level. Sedentary lifestyle and low consumption of fiber-containing food, such as whole grains was associated with colorectal cancer among the study participants. This is consistent with the reported colorectal cancer studies in developed nations indicating the global role of diet as an etiological factor for colorectal cancer incidence.

Role of Whole Grains in Reducing the Risk of Chronic Diseases

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Foods are eaten in a great variety, several times a day, throughout the lifetime and the dietary patterns determine the variability in nutrients intake. Whole grain foods are not only a good source of complex carbohydrates and dietary fibre but also contain many important essential nutrients (such as B-vitamins, vitamin E, selenium, zinc, copper, manganese) as well as non-nutrients (phytochemicals, phytoestrogens, lignans etc.), which have not yet been clearly identified and fully explored for their disease prevention potentials. It is difficult to say that the beneficial effects of whole grains are only due to their nutrient or non-nutrient contents *per say* and not due to other healthier lifestyle factors such physical activity, non-smoking, socio-economic status etc. The protective mechanism of action of wholegrain is poorly understood, however their main action appears to be due to their potential to improve the integrity of the gastro-intestinal tract, act as antioxidants and provide protection against a number of chronic diseases. Data from many epidemiological studies suggest a strong inverse association between the increased consumption of wholegrain foods and reduced risk of obesity, insulin resistance, diabetes, metabolic syndrome, cardiovascular disease and cancer. However, only a few strictly controlled intervention studies have so far confirmed the beneficial effects of increased consumption of whole grains,

whereas the other do not. Based on the available scientific data, recommendations have been developed to consume at least 3 servings of whole grains per day. Well-designed long-term randomized controlled trails are needed to provide more mechanistic evidence to support the health claims for whole grain foods. This review discusses the positive and beneficial role of whole grains in a healthy human diet and their biological mechanisms involved in disease prevention.

Whole Grain: The Boon and the Bane!

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Gastrointestinal health is characterized as maintenance of gastrointestinal function by promoting efficient digestion, optimal gut immune responses, minimal inflammation, and the absence of disease. Given the continuous exposure to pathogens and toxins from the external environment, it is challenging to maintain gastrointestinal health. Current data suggest that many factors affecting gastrointestinal health, including, lifestyle, diet, environment, genetics, and age. Many dietary components can positively affect gastrointestinal health, including fiber and many others. Of the myriad of foods, whole grains provide most of these beneficial effects. A lot is known about the risk reduction of coronary heart disease, diabetes and cancer with consumption of whole grains. This presentation will be focusing on some of the gastrointestinal benefits of whole grains. Despite the beneficial health effects, whole grains have some nutritional shortcomings that should be paid attention to. These too, will be discussed in this presentation.

Health Functionality of Whole Grains and their Main Constituents

Mohamed Essa. M[1, 2]

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Studies suggest that having whole grains in your diet may lower the risk of many chronic diseases and at least 3 servings daily consumption may lead most pronounced benefits. Inclusions of whole grains are strongly recommended by most of the dietary guidelines through-out the world due to the numerous evidences suggest that whole grains/whole-grain-based products will provide energy and nutrients as well as promoting health. Reports suggest that the whole grains may play in disease prevention. The main constituents of whole grains such as dietary fiber, inulin, beta-glucan, resistant starch, carotenoids, phenolics, tocotrienols, and tocopherols and their effect against various chronic diseases such as cardiovascular diseases and strokes, hypertension, cancer, etc., will be discussed in this review.

Whole Grain Products in the Traditional Indian Food System

E. Sukumar* and T. Anandan**

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India is an agricultural country with varied climates, altitudes, soil and precipitation pattern. It is known as the producer of different varieties of agricultural products that are utilized for internal consumption as well as exports. Though rice and wheat are the major produces, many whole-grain products such as ragi, Indian corn, common millet, Italian millet etc. are also cultivated and consumed in quite larger parts of India especially the tribal pockets. The whole grains occupied prominent place in the traditional food systems over many years and were consumed as the main source of nutrition and way of disease prevention. Ancient scientific literature such as *CharakaSamhita* and *PatharthagunaChinthamani* have dealt with in detail on various types of foods, their characteristics and nutritional cum medicinal values. But due to the invasion of modern foods, these traditional foods have gone into oblivion. With increasing incidents of under-nutrition and incurable diseases, of late, a renaissance in whole grain food consumption is dawn in the Indian food scenario. People started realizing that diseases which show phenomenal increase year after year could be prevented / checked only with the use of traditional foods. Many nation-wide programs to impart awareness among the public are on full swing in the media and educational institutions.

Grains in Agricultural Systems and Food of Traditional Communities in Northern Oman

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Four decades ago, grains including wheat, barley and millet were major subsistence crops in Oman and were the main food and feed crops besides few species of vegetables, legumes and fruits. Since then, Oman witnessed drastic changes due to rapid urbanization and modernization that swept throughout the country. This transformation resulted in a change people's way of life from mainly subsistence rural-farming communities to urban-metropolitan communities. Moreover, traditional crop farming methods of northern Oman and crops such as fababean, lentil, field pea, fenugreek, mung bean, chickpea and cow pea have mostly disappeared. Species disappearance was attributed to low productivity, profitability and farmer immigration from rural to urban areas for better employment opportunities. The improved income and availability of a wide range of food produce, that is largely imported, resulted in a shift in lifestyle and selection of food items. Because traditional means of living are disappearing at a rapid pace, a glance at this lifestyle may well define the better way forward as food-related health problems continue to rise at unprecedented levels. We explore the methods of farming and choice of food for rural communities in northern Oman to identify key food plants, both wild and cultivated, essential for these societies. As the world is searching for healthier food, such as whole grains, traditional crops and other alternatives

may provide insights on how local communities responded to change in lifestyle and eating habits.

Dietary Fiber: Recommendations and Efficacy

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It is the position of the Academy of Nutrition and Dietetics that "the public should consume adequate amount of dietary fiber from a variety of plant foods". Energy intake rather than clinical findings is the basis for the Dietary Reference Intakes (DRIs) for fiber. The energy intake is based on epidemiological studies indicating protective effect of dietary fiber against a number of none-communicable diseases. Clinical findings seem not to be conclusive about the amount of fiber that would have clinical efficacy in improving/treating some health conditions. This presentation will review fiber recommendations and efficacy of fiber in selected health conditions.

Sensory Properties of I*dli* while Replacing White Rice with Brown Rice

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Idli is a popular breakfast dish in the Indian subcontinent. The ingredients of this product are white rice (*Oryzasativum*) (75-80%) and black gram (*Phaseolusmungo*) (20-25%). The objective of this study was to determine the sensory properties of *idli* while replacing white rice with brown rice at 5 different levels (T1 – 0% replacement (control); T2 – 25% replacement; T3 – 50% replacement; T4 – 75% replacement; and T5 – 100% replacement). The untrained panelists (n=40) from a pool of Omani, Indian and other expatriates who were working or studying at Sultan Qaboos University were randomly selected in two categories: regular consumer of *idli* and first-time consumer of *idli*. Informed and blind sensory tests were conducted for the cooked *idli* products. The preference score for color of the *idli* products was significantly higher in the blind sensory test than in the informed sensory test. Female panelists and regular consumers gave higher scoresfor color property than male and first-time consumers. T1, T2 and T3 products scored higher (without differences among them) than T4 and T5 products. It shows that replacing up to 50% of white rice with brown rice did not affect the color preference by the panelists. There were no differences in the overall acceptability of T1, T2 and T3 products. But T4 and T5 products scored lower than the other products without difference between them. The sensory type did not affect the overall acceptability scores of *idli* products. This indicated that the products were acceptable up to 50% white rice replacement even without

product information. Regular consumers and female panelists gave higher scores for the overall acceptability of *idli* products than their counterparts. Irrespective of sensory and consumer types, 25%, 15%, 35%, 5% and 20% of panelists selected T1, T2, T3, T4 and T5 *idli* products, respectively as their first choice of preference. Among regular consumers, 50% of the panelists preferred the control *idli* as their first choice in the blind sensory test. But when the product information was given to the panelists, 100% of the panelists preferred brown-rice-blended *idli* products.

Whole Grains Phenolics and Tocopherols: Health Functionality- A review

Subash Selvaraju[1] and Mohamed Essa[1,2]

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Positive health effects of whole grains / integral cereals consuming is attributed to bioactive substances. The overwhelming interest to consumption of whole grains is increased since last decade due to their potential health benefits. Epidemiologic studies support that whole grains contain phenolics and tocopherols may useful to protect against cardiovascular diseases, strokes, hypertension, metabolic syndrome, type 2 diabetes mellitus, obesity, as well as different forms of cancer. Whole grains phenolics and tocopherols may be used to help the human diseases by reduce oxidative damage. This paper is review of literature related to the whole grains phenolics and tocopherols and their biological activity in various disease conditions.

Oats and Health Relevance in Cardio Vascular Diseases (CVDs)

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Prevention of CVDs has become the prime agenda for every international and national health authorities. Real Challenges are vested with them in formulating comprehensive prevention strategies. Even though etiologies of CVDs are complex, they are yet preventable. Dietary inclusion of whole grains and change in lifestyle can promisingly combat CVDs. Among the whole grains, oats provide diverse health benefits to humans through favorable physiological responses to act against the risk factors. Beneficial health effects of oats consumption attributed to its rich macro nutrients, micro nutrients, soluble fiber (β-glucans) and oat poly phenolic (Avns). Soluble fibers bind cholesterol during the intraluminal formation of micelles there by resulting in reduction of the cholesterol content of liver cells that leads to an up-regulation of the LDL receptors and thus augmenting the increased clearance of LDL-C. Avenanthramides (Avn) are the unique group of low-molecular weight soluble phenolic compounds found exclusively in oats e.g. (Avenanthramides 2c, 2p, and 2f). Avn-c inhibits the serum induced proliferation of vascular smooth muscle cells and interacts synergistically with vitamin C to protect LDL during oxidation. The sum of effects are attainable within the practical range of dietary intake e.g. 3 g soluble fiber from oats (3 servings of oatmeal, 28 g each) can decrease total and LDL -C by <0.13 mmol/L. However, what lies in the future is the role of biomedical agriculture is to identify the cultivars of

any food crops with an added advantage of providing increased health benefits.In a similar fitting for oats, such future oat cultivars can possess the higher amounts of bio active components such as β-glucans and Avns that can exponentially influence the risk factors associated with CVDs, whilst retaining the same quantities of oat consumption/dietary inclusion. It is urged that, health advocacy groups work closely with national health authorities to promote the consumption of oats as part of a healthy lifestyle. To promote such higher consumption they should be able to propagate and publish traditional recipes with slight modifications i.e. developing newer oat recipes with (regional and national) traditional diet choices. Nutritional research on oats in Asian population is limited. Understandably interventions that work in some societies may not work in others; because social, economic, and cultural forces influence diet and exercise.

Identification of Whole Grain Products

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In the plant, every grain starts out as whole grain. But they need to keep all three parts of the original grain (the germ, the bran, and the endosperm) in their original proportions to still count as whole grains. Whole grains cannot be identified by the color of the food. Bread, for example, can be brown because of molasses or other ingredients, not necessarily because it contains whole grains. Similarly, white colour whole wheat bread is recently developed. In USA, to identify the whole grain products, 'Whole Grain Stamp' has been created by the Whole Grains Council. If there is no such stamp, then the product can be identified from the ingredients list. Whole-grain products will be mentioned on the package label, such as whole grain (name of the grain), whole wheat, stone ground whole grain, brown rice, oats, oatmeal, wheat berries and so on. Products labeled as 'enriched flour', 'degerminated', 'bran', 'wheat germ' do not describe whole grain products. All products with high fiber content may not be whole grain products. Measures should be taken to mark the whole grain stamp or similar identification on the whole grain products produced all over the world.

Health Benefits of Millet Grains

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Millet is small seeded grains that are generally grown in subtropical and tropical regions. The most known species of millet are pearl millet, finger millet, proso millet, foxtail millet, kodo millet, little millet and barnyard millet. Millet offers a variety of health benefits to human. It is a high-energy, nutritious food, recommended for children, adult and the elderly people. Protein contents in millets are comparable with those in wheat, barley and maize. It is completely gluten free and more easily digested than other whole grains. Moreover, it is a good source of fiber, B vitamins, minerals (manganese and magnesium), cysteine and methionine amino acids. As millet contains all these nutrients, it is recommended for people with diabetes, heart diseases and blood pressure.

Availability of Whole Grain Products in Supermarkets of Sultan Qaboos University

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In spite of awareness and interests to consume whole grain products, the non-availability in the market place and canteens makes the people to get frustration and fail to consume the recommended amount of whole grains. A survey was conducted to quantify the availability of whole grain products in four supermarkets of Sultan Qaboos University. This Paper explains the availability of whole grain products and awareness about the availability.

Amaranth

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Amaranth is a bushy plant that is grown anywhere from 3 to 8 feet in height. It is highly nutritious, and the plant itself is extremely attractive and useful. Amaranth in early growth stage serves as an annual ornamental. There are two specific ornamental species of amaranth which are *Amaranthus tricolor L.* and*Amaranthuscaudates L.* Amaranth grain is very rich in nutritional value since it is gluten free so it is suitable for people with celiac disease. Amaranth grain contains high amounts of protein and amino acids like lysine, cysteine and methionine higher than any other gain which contributes to strong bones and improving the immune system. Medically, amaranth is used for battle diarrhea and gastroenteritis. It is utilized to reduce hemorrhaging and to treat ulcerated wound. Amaranth has ability to stop mouth ulcers and excessive menstruation and it can reduce tissue swelling from sprains and tick bites.

Innovative Approaches to Develop Ragi (*Eleusinecoracana*) Products for Healthy Diet

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Ragi or finger millet (*Eleusinecoracana*) is one of the most important minor cereal because of its superior nutritional quality and several health benefits. Finger millets are rich source of calcium, protein, fibre and minerals. It is a staple food of arid and semi-arid region of people for long time in Africa, India, China and South America. However urbanization in many places has reduced the intake of this millet in the regular diet. Thus development of innovative and tasty nutritious products from ragi such as biscuits, breads, cakes, halwa, laddu, poori and so on can improve the regular intake.

Opportunities and Challenges for Whole Grain Products Consumption in Oman

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Amaranth,corn, barley,buckwheat, millet, rye, wheat, rice and oats are types of grains. Bread, pasta, oatmeal, breakfast cereals and tortillas are examples of grain products.Whole grains and whole grain products are good source of fiber, vitamins and minerals and are typically low in fat. A diet rich in whole grains significantly reduces risks linked to cancer, cardiovascular disease, type II diabetes, obesity and chronic heart disease. The Dietary Guidelines from WHO recommend choosing products with whole grains rather than refined grains.

Recently, people's awareness and knowledge about the health benefits of whole grains has increased significantly. Also, people understand that whole grains can bring new enjoyment to their menus and can be part of great new food combinations. Thus, they demand for more whole grains in their diet, in restaurant menus and in the market. Therefore, all over the world health authorities are concerned about adding the whole grains and whole grain products to the diet. For example, USA, Canada, Oman and many others developed guide plans for healthy food recommendation which differs from country to country according to the cultural believes and social and traditional habits. These guide plans give whole grains and whole grain product more attention. Food industries recognize the demand for whole grain products. Thus, they are trying to make whole grain products similar to refined grain products in appearance, texture and taste.

Intake of whole grain products in Oman is limited because of the lack of consumer awareness about the health benefits of whole grains. Most of the time people don't like to change their traditional habits related to food consumption. Higher prices for some whole grain products, lack of knowledge in preparation methods and difficulty in identification of whole grain products in the market can limit whole grain products consumption. Poor marketing for the whole grain products leads to lesser demand. On the other hand, manufacturers do not like to make whole grain products because they get spoiled quickly. Furthermore, while the manufacturersare developing whole grain products in commercial, they have to change the mills because each grain has different properties, ultimately it leads to higher cost of production.

Health authorities in Oman must educate people withclear information about whole grains. Manufacturers have to make whole grain products available all the time with reasonable prices. The Government should motivate companies to produce whole grain products by giving subsidies for new product development and marketing.

Health Benefits of Corn

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Corn is one of the most important types of whole grain because of its health benefits. Many studies confirm that consumption of corn protect against several chronic diseases. It acts as antidiabetic, antihypertension, antioxidant, cancer preventive and reducing level of cholesterol in the blood. So, consumption of corn is important to achieve optimum health benefits.

Health Benefits of Barley

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Scientific studies have proven the effectiveness of barley in reducing the high levels of cholesterol in the blood through a number of biological processes. The soluble fiber in barley helps to reduce excess cholesterol in the blood. Also, the fermentation of soluble fiber in the colon absorbs fatty acids of the colon and interferes with the metabolism of cholesterol in hindering rise of the blood pressure. Finally, barley contains chemical compounds that reduce cholesterol levels in the blood, and raise the body's immune ability, such as beta glucan or B-Glucan. The recent research proves that the existence of materials like potassium, magnesium, antioxidants in barley play a role in alleviating depression. Potassium, magnesium and vitamin B for example have an effect on neurotransmitters which help alleviate depression. Amino Acids tryptophan can contributes to the biosynthesis of one of the neurotransmitters serotonin.

Innovative Recipes with Whole Grains

Oats with Dates - Porridge

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Ingredients:

1. Oats – 1 cup
2. Milk (skimmed or whole milk) – 3 cups
3. Water – ½ cup
4. Date dhibs – 2 tea spoons
5. Raisins – 2 tea spoons

Optional ingredients:

Butter – 1 tea spoon

Procedure:

1. Take oats, milk and water in a microwavable bowl and microwave it for 5 to 8 minutes.
2. Keep stirring the content every minute.
3. After cooking add date dhibs, raisins and serve while it is hot.
4. For children, add sufficient amount of butter to enhance the flavor and taste. This can be taken as breakfast or dessert.

Whole Grain Wheat Chips

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Take a package of whole grain flat breads (lulu 100 bz)
Separate each bread into two disks (upper and lower)
Cut the disks into 8-12 wedges.

Prepare a mix of:
olive oil and spices (garlic, thyme, pepper, paprika, cumin, etc...) you choice.
Gently brush some of the parfumed oil on the rough side of each wedge
Put under the grill until golden color and crispy (1-3 minutes)
Put into a bowl and gently sprinkle with sea salt.

Ready to serve (delicious, nutritious..) a good alternative to store bought potato chips.
You can even used them like corn chips to take dips (guacamole, salsas...)

Ragi Pakode

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Ingredients:

1. Ragi flour
2. Rice flour
3. Rava
4. Coconut (grated)
5. Green chilli paste
6. Cauliflower
7. Salt
8. Oil

Method:

1. Extract coconut milk
2. Add ragi& rice flour with coconut milk
3. Add rava for crispiness
4. Cut cauliflower in to small piece and add it with above mixtures
5. Fry in the pan till to get crispy
6. Then ready to serve

Ragi Poori

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Ingredients:

1. Ragi flour
2. Wheat flour
3. Salt
4. Oil

Method:

1. Add ragi& wheat flour and mix thoroughly.
2. Add little salt to get taste.
3. Make a roundshape and deep fry in the oil.
4. Then ready to serve

Ragi Halwa

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Ingredients:

1. Ragi – whole grain
2. Sugar
3. Coconut milk
4. Ghee
5. Cashew nut
6. Elachi powder
7. Almonds(grated)

Method:

1. Soak ragi whole grain in the water overnight
2. Grind the ragi and extract ragi milk
3. Add coconut milk, ragi milk and sugar
4. Stir the mixture continuously in the hot pan to avoid lumps
5. After 5 min add ghee
6. Continue the process for next 10 min
7. Finally add cashew, almond, elachi powder
8. Transfer to plate for serve.
9. Then ready to serve

Ragi Laddu

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Ingredients:

1. Ragi flour
2. Jaggery
3. Cardamom powder
4. Cashew nut (grated)
5. Raisins

Method:

1. Fry the ragi flour with low flame
2. Prepare the jaggery syrup
3. Add ragi flour in the jaggery syrup
4. Finally add cardamom, cashew and raisins in the mixture
5. Immediately make ball shape to get proper laddu shape
6. Then ready to serve

Ragi Vadai

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Ingredients:

1. Ragi flour
2. Cabbage
3. Cauliflower
4. Onion
5. Green chilli paste
6. Curry leaves
7. Coriander leaves
8. Mint leaves
9. Salt
10. Oil

Method:

1. Cut all above mentioned leafy vegetables into small pieces
2. Add that vegetable pieces in the ragi flour and make it as dough
3. Make shape and fry it in the hot plain pan
4. Then ready to serve

Whole Grain Bread

Nasiba

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Ingredients:

1. Whole grain flour – 500g
2. Baking powder – 17g
3. Whole-grain oat flakes – 3tbsp
4. Quinoa – 3tbsp
5. Sunflower seeds – 1tbsp
6. Sesame seeds - 1tbsp
7. Salt – 1tbsp
8. Buttermilk – 0.5L

Method:

1. Mix all ingredients together until you obtain soft, non-sticky dough.
2. Place the dough onto a baking tray lined with baking paper and form into a rectangular or round shape.
3. Moisten the surface with a little bit of water and spread some whole-grain oat flakes onto it.
4. Bake in the preheated oven for about 40 min at 180 degrees. Leave to cool for 2 hours.
5. Then cut into slices and serve with butter and marmalade or any healthy spread.

Bon appetit!

Miso Soup

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Ingredients:

1. Barley – 1/2cup
2. Greenpeas – 1/2cup
3. Corn – 1/2cup
4. Legumes (e.g. beans)
5. Lentils – 1/4cup
6. Milk – 4cups
7. Olive oil – 1tsp
8. Salt – 1tsp

Methods:

1. Put the milk on low heat.
2. Addto thebarley milk for twenty minutes and mix.
3. Add thevegetables (lentils, peas, legumes, corn) after cooking alone with little water).
4. Addsalt andolive oil

Whole Grain Cakes

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Ingredient:

1. Whole wheat flour – 2 1/2cup

2. Salt – 1/2tsp

3. Sugar – 1 1/2tsp

4. Egg - 5

5. Baking powder – 2tsp

6. Orange juice – 1cup

7. Vanilla

8. Soft drink (7 up) – 1cup

9. Oil – 1cup

Method:

1. The eggs are mixed with salt, sugar powder, orange juice, soft drink, oil and vanilla together.

2. Then the flour mixed with baking powder and added regularly to the paste.

3. Finally the dough is poured in a baking plate and placed in the oven until it gets red.

Oat Meal Chicken Stew Breakfast

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Ingredients:

1 Cup Oats

½ Cup Green gram(skin removed halves)

50 gm chicken breast

50 gm Tomato

10 gm Onion

1 tablespoon Olive oil

1 teaspoon Salt

Method:

1. Boil oats,green gram, chopped tomato and onion with 3 cups of water. Cook until it come to complete boiling (Add little water and stir if oat gets too thick).

2. Meanwhile, cut the chicken breast in to small pieces and shallow fry in 1 tablespoon of olive oil.

3. Combine/mix the prepared chicken with boiled oats. Add 1teaspoon of salt if required and serve.

Approximate household guestimate of nutritional content:

Proportion of carbohydrate (Oat, Onion, Tomato and Green gram):**55 percent**

Proportion of protein (Green gram, Chicken):**30 percent**

Fat (Olive oil and chicken):**15 percent**

Glycemic Index: **Low** – compared to some conventional breakfast.

Oats Biscuit

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- Ingredients:
    1. 2 cup Oats powder.
    2. 3 eggs.
    3. 1 cup oil.
    4. 1 cup sugar.
    5. 2 spoon baking powder.
    6. 1 spoon Vanilla powder.

- Recipe:
    1. All the ingredients are mixed together.
    2. The dough is shaped in circles.
    3. The circles of dough are backed in the oven.

Brown rice - chana biriyani

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Ingredients:

1. Brown Basmati Rice - 1 1/2 cup

2. Ghee - 2 ½ tsp

3. Fennel – 1 tsp

4. Spices (Cloves – 3, Cardamom - 2, Cinnamon – 1, Bayleaf-1)

5. Fried onion – ½ cup

6. Fried cashews and raisins – 2 tbsp each

Masala:

1. Garbanzo beans - 1 cup

2. Chana masala - 3 tbsp

3. Oil - 3 tbsp

4. Onion sliced - 1 1/2 (medium)

5. Tomato chopped - 1

6. Garam masala - 2 tsp

7. Cumin powder - ½ tsp

8. Lemon juice - 4 tbsp

9. Salt – to taste

For grinding:

1. Ginger –garlic paste – 2 tsp

2. Green chilies – 2

3. Coriander leaves - ½ cup

4. Mint leaves – ½ cup

5. Coconut – 1 ½ tbsp

6. Tomato – 1

Method:

1. Soak chana overnight and pressure cook it with salt for 3 – 5 whistles and simmer for 45 min and drain. Set aside.

2. Soak rice for 45 min, strain and set aside.

3. Heat oil in kadai; add half the spices (fennel, cloves, cinnamon, cardamom and bay leaf).

4. Add onions and sauté until golden brown.

5. Add ginger – garlic paste and tomato and fry until oil oozes out.

6. Add the lemon juice, ground paste, chana masala, garam masala, cumin powder and salt and sauté for 5 min.

7. Add cooked chana, mix well and cover and cook until the gravy is reduced.

8. Heat ghee in a pan, add the remaining spices and fry for a minute.

9. Fry rice in ghee for 2 min and add enough water to cook.

10. Once cooked, drain and keep aside.

11. Layer the rice and chana mixture with fried onions, cashews and raisins and microwave or bake for 15 min at very low heat.

12. Serve hot with Onion raita and lemon pickle.