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Processing of moringa leaves (Nutrients Source) for human consumption

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Abstract
Moringa Oleifera leaves are extremely valuable source of nutrition for people of all ages. Moringa leaves contain affluence of essential, disease preventing nutrients. They even contain all of the essential amino acids, which is unusual for a plant source. The young leaves are edible and are commonly cooked and eaten like spinach or used to make soups and salads. They contains good source of vitamin A, vitamins B, and C, minerals, and the sulphur. Moringa Oleifera leaves could be a great boon to people who do not get protein from meat. The micro-nutrient content is even more in dried leaves; (ten times the vitamin A of carrots), (17 times the calcium of milk), (15 times the potassium of bananas), (25 times the iron of spinach) and (nine times the protein of yogurt).they contain higher amounts of many of these nutrients.

Keywords: Moringa, nutrients source, human consumption

Introduction
Moringa oleifera is a multipurpose and exceptionally nutritious vegetable tree with a variety of potential uses. It has very high nutritional properties that would be useful as a food supplement. Besides its nutritional and medicinal applications, Moringa oleifera is very useful as an alley crop in the agro-forestry industry. It is useful not only for human beings. The leaves, fruit, flowers and immature pods of this tree are used as a highly nutritive vegetable in many countries, particularly in India, Pakistan, Philippines, Hawaii and many parts of Africa. Moringa has been used as a traditional medicine around the world for anemia, skin infections back heads, anxiety, bronchitis, chest congestion, asthma, blood impurities, cholera glandular, swelling, headaches, conjunctivitis, cough, diarrhea, eye and ear infections, fever abnormal blood pressure, hysteria, pain in joints, pimples, psoriasis, respiratory disorders, scurvy, semen deficiency, sore throat, sprain, tuberculosis, for intestinal worms, lactation, diabetes and pregnancy. The leaves possess remarkable nutritional and medicinal qualities. They contain high amount of vitamin C, which fights a host of illnesses including colds and flu; vitamin A, which acts as a shield against eye disease, skin disease, heart ailments, diarrhea, and many other diseases; Calcium, which builds strong bones and teeth and helps prevent osteoporosis; Potassium, which is essential for the functioning of the brain and nerves, and Proteins, the basic building blocks of all our body cells. Another important point is that Moringa leaves contain all of the essential amino acids in a good proportion, which are the building blocks of proteins. These leaves could be a great boon to people who do not get protein from meat. The micro-nutrient content is even more in dried leaves; (ten times the vitamin A of carrots), (17 times the calcium of milk), (15 times the potassium of bananas), (25 times the iron of spinach) and (nine times the protein of yogurt).
Therefore it is necessary to increase the utilization of Moringa leaves consumption by the different communities. It should be consumed either fresh or dry. Dried leaves can be stored for a long time and can be used regularly. So it is necessary to hygienically drying and processing of Moringa leaves further uses.

Material and Methods
Harvesting Leaf
Young and old leaves both are suited to making dried leaf powder. Moringa leaves can easily lose moisture after harvesting, therefore, harvest early in the morning and complete the initial phase of processing in the same day, if possible.

Washing
Collected leaves are washed in running tap water till the removal of dirt. After this leaves are soaked in 1% saline solution (NaCl) for 5 minutes to remove microbes.

Leaves are further washed with 70% ethanol followed by twice washing with distilled water to remove of dust, pathogens as well as microbes present on the leaves surface. The excess water can be removed by spreading the leaves in sunlight for a brief period till the removal of water present on the surface.

Drying

It is estimated that only 20-40% of vitamin A will be retained if leaves are dried under direct sunlight, but that 50-70% will be retained if leaves are dried in the shade. High temperature may lead down to the breakage of protein present in the leaves. Therefore shade dry is recommended for the drying process. Spread the leaflets on the sterile clean green net in a well-ventilated room. Mosquito net may be used for this purpose because these materials give a space between the floor and the leaves. This room should be insect, rodent and dust proof. Air circulation can be improved by using ceiling and floor level vents protected with a clean filter to keep the sun and dust out. It is possible to use a fan, but the air must not be directly oriented towards the leaves, as it can increase contamination with germs in the air. Leaves should be completely dry within a maximum of 4 days. All persons involved in this step must ensure that, while on duty, personal cleanliness and hygiene are maintained.

Grinding

In small scale dried leafs can be grinded by mortar and pestles or pulmonizer machine can be used for fine grinding. Commonly 0.5 mm – 1.0 mm pore size screen is used for the separation of the fine grinded leaf powder.

Drying of the leaf powder

Moringa leaf powder immediately absorbs moisture and the product can reabsorb humidity during or after grinding. For this reason, Moringa leaves powder should be dried at 50 ^{0}C for 30 minutes to reduce moisture content. If stored powder is exposed to heat or light it will degrade and nutrient content will be reduced. Moringa Leaf Powder can be stored for up to 6 months under the following conditions: clean, dried powder stored in air-tight containers, protected from light and humidity and kept below 24 ^{0}C.

Plate 1: Moringa fresh leaves

Plate 2: Moringa dry leaves

Plate 3: Moringa leaves powder

Plate 4: Ready to eat (Leaves powder)

Result and Discussion

Moringa trees have been used to combat malnutrition, especially among infants and nursing mothers. One rounded tablespoon (8 g) of leaf powder will satisfy about 14% of the protein, 40% of the calcium, 23% of the iron and nearly all the vitamin A needs for a child aged 1-3. Six rounded spoonful of leaf powder will satisfy nearly all of a woman's daily iron and calcium needs during pregnancy and breast-feeding." Leaves can be eaten fresh, cooked, or stored as dried powder for many months without refrigeration, and reportedly without loss of nutritional value. Moringa is especially promising as a source in the tropics because the tree is in full leaf at the end of the dry season when other foods are typically scarce. Spoonful of the powder can then be added to baby food, soups, and vegetables, adding nutrition but not changing the taste. This powder can be used in place of fresh leaves to make lead sauces, or few spoonful of the powder can be added to other sauces just before serving. Addition of small amounts of leaf powder will have no discernible effect on the taste of a sauce. In this way, Moringa leaves will be ready available to improve nutrition intake on a daily basis.

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