

Рисунок 3 – Гидравлический нож и маслостанция

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## MECHANICAL DRYING OF MORINGA OLEIFERA LEAVES

**Introduction.** The Moringa plant (*Moringa oleifera*) is known worldwide for its nutritional and medicinal benefits as well as industrial uses (table 1 and figure 1). Almost every part of the Moringa plant has nutritional value. The pod is cooked as a vegetable in many countries. The root can be used as substitute for horse radish. Foliage is eaten as

greens, boiled, fried, or in soups. Leaf powder can be added to any kind of meal as a nutritional supplement. The seed can be roasted and eaten like a peanut.

The objective of the paper is to enable farmers and entrepreneurs to attain quality standards of Moringa leaves powder by practicing year round, simple and efficient Moringa leaves drying method, thereby enhancing capacity. In table 1, Moringa plant parts, their benefits and some useful ingredients in parts of the Moringa are shown.

Table 1 – Benefits and ingredients in parts of the Moringa plant

<b>Tree part</b>	<b>Uses and/or benefits</b>	<b>Ingredient</b>
Leaves	Nutritional, forage, biomass, plant growth hormone, medicinal	Hormones, bioflavanoid, arachidic acid, oleic acid, linoleic acid
Flower	Nutritional, medicinal, honey	Bioflavanoid, pterygospermin
Fruit/pod	Nutritional, medicinal	Arachidic acid, oleic acid, linoleic acid
Roots	Medicinal	-
Seed	Cosmetics, food, water treatment, medicinal	Arachidic acid, oleic acid, Linoleic acid
Wood	Paper, alcohol production, animal feed, medicinal	Lignin/cellulose, alcohol, bioflavanoid
Bark	Rope making, gum for tanning hides, medicinal	Bioflavanoid, lignin/cellulose, alcohol

From the table 1 above, it can be deduced that all parts of are useful such as used as a flocculent for water clarification, as a lubricating oil (Ben oil) for watches and delicate machinery. Leaves and young branches are used as fodder and also used in fish and poultry feeds. The bark yields a blue dye and can also be used in tanning. The wood can produce paper. A plant growth hormone can be extracted from young shoots, which when applied as a foliar spray to increase yields. Last but not least, almost every part of the plant has pharmacological properties [1]. Figure 1 shows traditional medicinal uses of Moringa leaves [2].

From the figure 1 above, it is clear that Moringa leaves are used to treat inflammation, infections disorders, and various problems of the cardiovascular and digestive organs, while improving the liver function and enhancing milk flow in milking mothers.

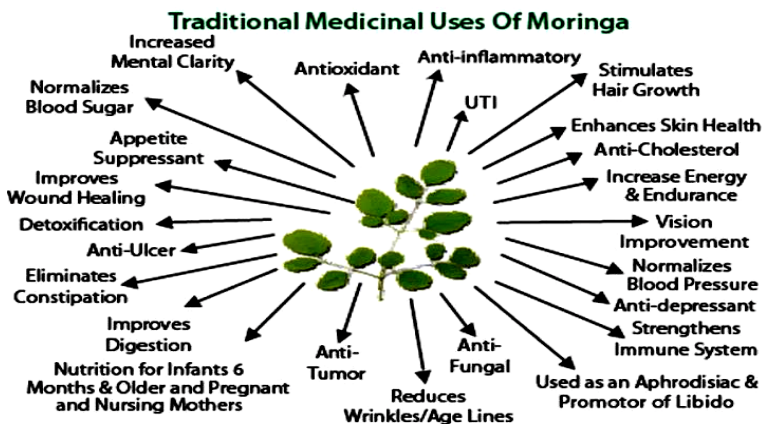


Figure 1 – Traditional medicinal uses of Moringa

**Mechanical drying.** Considering the importance of this miracle tree and leaves powder production, there is need to develop a suitable means of drying the harvested leaves while retaining its medicinal and other nutritional values. In preservation by dehydration (drying), the amount of water in a food is denoted by its moisture content. A food's storability is directly related to moisture content, along with temperature and oxygen availability. Fresh Moringa leaves contain about 75% moisture whilst the dried leaf powder contains about 7.5% moisture [3].

There are three methods of drying Moringa leaves: room drying, solar drying and mechanical drying. In room drying leaves take a maximum of four (4) days to completely dry with a loading density of not more than 1 kg/m<sup>2</sup>. Room drying is not suitable due to presence of mould growth even with the recommended minimum moisture content of 10%. Solar drying provides effective drying within short period of time (4 hours) at a temperature ranging between 35 to 55° C on a very sunny day. Loading density should not exceed 2 kg/m<sup>2</sup>. However, this method is not effective where there is not enough sunlight especially during raining season. While drying in this way, the foods were exposed to the vagaries of the weather and to contamination by insects, birds and animals. Drying times were long and spoilage of the food could occur before stable moisture content was attained.

Mechanical drying method involves the use of mechanical devices or machines such as fans and heaters or electric or gas hot-air dryers in their operations. Mechanical drying is usually employed by large scale commercial food processing industries. Mechanical drying ensures year round

production and loading density exceeds those of the other methods – 2.5 kg/m<sup>2</sup>. Therefore, it is recommended for both small and large scale processing especially if production is continuous one. Drying temperatures should range between 50°C and 55°C. If temperature exceeds 55°C, leaves will "burn" and turn brown. Leaves should be dried until their moisture content is below 10%. Two most popular mechanical drying method of Moringa leaves are: 1. Cabinet (Tray) drying and 2. Tunnel drying. Other mechanical drying methods are: rotary drying, pneumatic (flash) drier, fluidised bed drying, bin drying, and conveyor (belt) drying.

**Conclusion.** Nutritional and medicinal values of Moringa leaves were discussed that makes it to be an essential supplement plant in any meal. Methods of mechanical drying were also enumerated showing the advantages and disadvantages of each in order to make recommendation for intensive production. The paper recommends mechanical drying as it provides year round utility.

### References.

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## ПРИРОДНО-ПРОИЗВОДСТВЕННЫЕ УСЛОВИЯ СЕЛЬСКОГО ХОЗЯЙСТВА КИТАЯ

### Введение

Китай имеет большой спектр различных агротехнологий благодаря его данной сельскохозяйственной истории (8000 – 9000 лет). Но из-за ряда исторических и социальных причин современное сельское хозяйство значительно отстаёт от развитых стран в мире, таких как США, Германия, Ново Зеландия.