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Three Cheers for Job's Tears: Asia's Other Indigenous Grain

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Introduction

In many parts of tropical Asia, especially on rainfed farms, there has been an explosion of acreage planted in maize. The increase in commercial maize production is driven by growing livestock feed demand, and is displacing many traditional crops, including the staple upland rice.



(/resources/c608e6d0-42d5-4da0-9a0b-fc8245417df4)Prior to the current Asian maize boom, and even thousands of years before European traders brought the crop to the Far East, a plant called Job's tears (*Coix lacryma-jobi*) was grown across Southern, Southeast and Eastern Asia. The crop continues to be planted, as a cereal for human consumption, and also as animal feed (both grain and fodder).

Botanically, Job's tears is described as an annual, erect grass, 1- 2 m tall, with maize-like brace roots that grow from the lower nodes. The grass is monoecious, having separate male and female flowers on different parts of the plant. The female flowers produce yellow, purple or brown seeds; often tearshaped (hence the name). Soft-shelled varieties are eaten (*Coix lacryma-jobi* var. *ma-yuen*) and hard-shelled varieties (*Coix lacryma-jobi* var. *stenocarpa* and var. *monilifer*) are often used as ornamental beads (FAO).

Job's tears is not considered a major grain crop, and is often relegated to millet status, i.e. one of the small-seeded cereal crops grown for food and fodder. The plant is even minimized among millets; the only mention of the grain in the FAO publication *Sorghum and millets in human nutrition* is that Job's tears is "of minor importance."

Perhaps Job's tears deserves a bit more attention.

Traditional Uses of Job's tears

Job's tears is consumed as a grain by both humans and livestock. According to PROSEA's *Coix lacryma-jobi* website, a 100 g edible portion of the husked grain of Job's tears contains: water 10.1- 15.0 g, protein 9.1-23.0 g, fat 0.5-6.1 g, carbohydrates 58.3-77.2 g, fiber 0.3-8.4 g and ash 0.7-2.6 g. The energy value is about 1500 kJ/100 g. Despite its minor crop status, Job's tears is a nutritious grain, containing more fat and protein than rice and wheat.

Both sticky and non-glutinous varieties are grown throughout much of South and Southeast Asia, as well as parts of China. Job's tears is consumed in various ways; for example, it is steamed like rice and included in soups, beverages and desserts. Although dough made exclusively from Job's tears flour will not rise because of the absence of gluten, a recommended mixture for bakery purposes is 70 percent

wheat flour and 30 percent Job's tears flour (PROSEA).

Job's tears is also fermented into beer. Anthropologist Dr. Malcolm Cairns reports that although the crop is rapidly disappearing from the upland fields of the Angami Nagas in northeast India, Job's tears was traditionally grown by the Naga farmers to be fermented, and also for use in snacks and tea.

The Naga farmers also used Job's tears as pig and chicken feed. As a locally-sourced animal feed, Job's tears can be fed to animals when ground, broken, or as a whole grain. PROSEA reports that Job's tears flour can replace maize flour in poultry feed.

For forage purposes, the FAO's *Coix lacryma-jobi* L. Grassland Species Profiles web page states that Job's tears green material is very palatable. The site also offers forage nutritional information for fresh, early vegetative Job's tears growth in India: 29.9 percent dry matter, 8.5 percent crude protein, 27.9 percent crude fiber, 8.96 percent ash, 2.7 percent ether extract and 51.9 percent nitrogen-free extract.



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Steamed Job's tears

The FAO reports that in India, Job's tears forage yields about 13.9 tons of green material per hectare (6.1 non-metric tons/acre). The Indian Grassland and Fodder Research Institute offers a few forage varieties of Job's tears, including Bidhan Coix 1. This variety is reportedly suitable for cultivation in West Bengal, Orissa, Assam and north Bihar with an average green fodder yield of 34.6 t/ha (15.22 non-metric tons/acre) and a dry matter yield of 6.9 t/ha (3.04 non-metric tons/acre). Several cuts of Job's tears fodder per year are possible.

In addition to agricultural and nutritional applications, Job's tears has also been used in traditional Chinese and Indian medicine. The grain contains kanglaite, a neutral lipid extract from the endosperm, which has been endorsed as a treatment for lung, liver, stomach and breast cancers by the Chinese government. Medicinally beneficial compounds in Job's tears seeds which have antitumor properties include coixenolide, palmitic acid, stearic acid, oleic acid and linoleic acid (Waraluck, et al.).

Finally, the hard, inedible seeds of the non-grain varieties (Coix lacryma-jobi var. stenocarpa and var. monilifer) are often employed as beads that are sewn onto garments and used for rosaries.



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Ornamental Job's tears seeds

Jamlong Pawkham with the Upland Holistic Development Project based in Chiang Mai describes the hard, ornamental Job's tears seed as having both long grain and oval shapes. The seeds are naturally hollow and can be threaded as beads. Pawkham shared that an informal market for the ornamental seeds exists in northern Thailand among business people making hilltribe handicrafts and/or those buying seeds to sell to other handicraft makers. In 2010 the reported value of 20 liters of Job's tears seed was 400 baht (\$13.00 US).

Commercial Opportunities for Job's tears - Reliable Markets?

Commercial markets for Job's tears exist, especially in China and Taiwan; for these markets, the crop is processed into various food and beverage products

that are often marketed under the name "Chinese Pearl Barley," even though the crop is not true barley (*Hordeum vulgare*). Compared to maize and other major field crops, the regional Job's tears market is much less developed.

Beginning in the 1990s, commercial Job's tears production has been occasionally promoted in Laos as a means of alleviating rural poverty. However, a 2006 UNESCAP-CAPSA paper reported that the farm gate price of agricultural products, including Job's tears and other crops, has remained rather low because outside middlemen hold the power in negotiating prices. From the farm, domestic Job's tears is exported abroad as a raw material for processing, with the finished products finally imported back into Laos, ready-to-eat but with a higher price. The writers recommended that processing product investment should be made domestically to increase the value of Job's tears products in order to help Lao farmers generate higher incomes (Douangsavanh and Bouahom).

Fortunately, domestic Job's tears processing in Laos is becoming a reality. ECHO network member Kirby Rogers reports that XP Trading Co. (<http://xptradingcompany.com/>), located in Vientiane, can now de-hull the Job's tear berry (i.e. seed) into a whole berry, cracked berry or flour.

Elsewhere in Southeast Asia, food scientists are also looking at new ways to process the grain into local food products. For example, food scientists at Mae Jo University are studying the potential of manufacturing ice cream from Job's tears (Waraluck et al.).

Job's tears Ecology

PROSEA describes Job's tears as a quantitative short-day plant (i.e. it undergoes accelerated flowering under short-day conditions, but will flower under either long- or short-day conditions) that requires high temperatures, abundant rainfall and reasonably fertile soils. In the tropics the plant can occur up to 2000 m (6561 ft.) altitude.



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Wild Job's tears

While intolerant of drought, Job's tears will grow in flooded conditions. Wild stands are often found in wet areas along streams and ditches. Dr. Lory Lirio, a Philippine Job's tears researcher, states that in exposed, swampy areas, wild stands regenerate themselves through tillers and seeds.

Job's tears can spread naturally, but slowly, in favorable locations (FAO). However, according to Dr. Lirio, in many places wild Job's tears is under threat due to heavy seed harvests that may prevent stands from reseeding themselves.

Job's tears Cultivation

Job's tears is often found planted in stands or dispersed in and around upland fields. According to PROSEA's Coix lacryma-jobi website, seeds should be pretreated before planting with a fungicide, or by submerging seeds in hot water (60-70°C /140-158°F) for about 10 minutes to control smut fungus (*Ustilago coicis*). Then the crop can be established by dibbling seeds about 5 cm (2 in.) deep into prepared fields at the beginning of the rainy season. Hills should be spaced approximately 30 cm (12 in.) apart in rows 40-80 cm (16-32 in.) apart with a seed rate of 7-15 kg/ha (6.2-13.4 lb./acre). Propagation by cuttings is reportedly possible, especially for fodder production, however no details were provided.

Seeds germinate in one to two weeks. The plant grows vegetatively for at least four months before flowering and pollination occur. Grain filling takes another two months. The stalk begins to dry when most of the seeds are mature. After threshing and husking the grain (either manually or with the same tools used for rice), it is dried for storage. Under humid conditions, the grain does not store well though the whole grain reportedly stores better than husked grain (PROSEA).

Both the FAO and PROSEA report Job's tears yields of 2-4 tons of husked grain per hectare (0.9-1.8 non-metric tons/acre), with a hulling percentage (amount of grain remaining after husking) of 30-50 percent.

Why Promote Job's tears?

A Palaung hilltribe farmer, Nam Saeng Loongmuang, explains that in addition to the main upland rice crop, hill field cultivators along the Thai-Myanmar border would traditionally integrate local varieties of maize, sorghum (*Sorghum bicolor*) and Job's tears as possible famine food (should the main rice crop fail) and as supplemental grain for both human and livestock consumption. Grain crop diversity, particularly for small holder subsistence farmers, is a very good reason to incorporate Job's tears production.

Another advantage of Job's tears is the crop's resilience, as it is affected by very few diseases and pests and requires little care. The crop is also productive in waterlogged, acidic and lateritic soils, and on degraded, sloping land (Pandey and Roy).

As a flavorful grain with more nutrition than rice and wheat, Job's tears is a potentially important cereal for a growing world population. Besides, both the grain and the forage are viable livestock and poultry feed options.

The ECHO Asia Seed Bank offers a selection of Job's tears seed called 'Mekong Mix'. Click on this link to access the seed bank catalog and to place seed orders ECHO Asia Seed Bank Catalog.

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