

Job's tears: A Less Known Multipurpose Crop

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ARTICLE ID: 20

Introduction

There are various crops which are very popular and cultivated throughout the world. Cultivation of crops has a great role in mitigation of food demand of the world's population. However, there are also some crops which are less recognized or less known. Interestingly, these crops serve as food source for human beings and livestock. Besides, they offer multipurpose uses as well as nutritional benefits. Job's tears is one such less highlighted crop which has been grown wild or cultivated since centuries. Its reference was even found in the holy Bible. This crop has versatile uses and thus, can generate income in rural areas.

Job's tears

Job's tears or *Surnoor Yulmu* or *Hatomugior Adlay* or *Coix* (*Coixlacryma-jobi* L.) belonging to the family poaceae and originated from South-East Asia, is grown mostly as multipurpose annual crop (although perennial in nature) in tropical and subtropical regions of the world specially, China, Japan, Korea, Philippines, Taiwan, Myanmar, India, Sri Lanka and other Asian countries. This crop has been neutralized to Southern USA and Tropical New world countries. It is known in various names like *Jagradi* in Sanskrit, *Sankru* in Hindi, *Gurgur* in Bengali, *Megarua* in Garo, *Sohriew* in Khasi and *Kunch* in Tripuri. It resembles to pearl barley in terms of look. However, these are different. Unlike Job's tears, pearl barley contains gluten. Job's tears is rich in protein and iron and less fibrous. The name 'Job's tears' indicates droplet or beads shaped seeds, generally, white in colour with brownish groove on one side. This crop is highly cross pollinated (through wind) and grown any time except winter mainly during hot and humid rainy season in clay or clay loam soil of low lying areas. In West Bengal, Bihar and Assam, its wild type is found as floating aquatic weeds in low lying areas. Ruminta *et al.* (2017) observed that it grew best under condition of high rainfall, moderate temperature, low relative humidity with wider spacing. Annual temperature of 9.6-27.8^o C (optimum: 21.5^o C) and pH

of 4.5-8.4 (optimum: 6.2) are considered ideal for Job's tears production. During seed setting phase of this crop dry period is needed. This crop can be found from plains to hill up to 2000 m above mean sea level. This crop can be grown alone or mixed with rice or rice bean. KCA-3, KCA-4 and Bidhan Coix-1 are some promising coix varieties grown in India specially in N.E. hills. This crop is found growing in grassland, meadows, gardens and wet sunny areas of hills and foothills of Western Himalayas. In many places like Polynesia, Italy, Korea, Hawaii, Iran, Japan, Micronesia, Puerto Rico, Cambodia, Borneo, Myanmar, Australia, Congo, China, Colombia, Costa Rica, Fiji, Ghana, India, Iraq, Guatemala, Honduras, Hong Kong, Melanesia, Nepal, Pakistan, Peru and Philippines, Job's tears is considered as weed.

Botanical description

Job's tears is erect, branched, tall (1-3 m long), glabrous, and robust growing monoecious plant having brace roots appearing from lower nodes. Plant of more than 1 m ideally has 7-8 tillers with spongy internal tissues. Leaves are long, broad and flat with linear leaf blade (lanceolate, acuminate and cordate) while, seeds are white or purple or white or light brownish, polished, pear-shaped (resemblance to tear drop) and highly shattering in nature. Wild species has grey, bluish grey, brown or black coloured seeds. Inflorescence appears in the axils of upper leaves on 3-6 cm peduncle. It shows non-synchronous flowering and has seed index of 16-17 g. This crop requires 150-160 days to be fully matured.

Multipurpose uses

1. Coix is treated as a decorative crop for gardens in some places, while in other places, it (*Coixlacryma-jobi* var. *ma-yuen*) is grown for its grain or fodder. It is widely used in breads, soups, pastries, drinks and salads. It is a notable fact that Job's tears is tasty and edible part of this crop is soft hulled seed. Coix seeds as minor cereals are consumed fresh or dried. Whole seeds are roasted to make porridge or fermented to make alcoholic beverage (like brewing beer). Seed flour either alone or with rice or wheat flour is used in making various dishes. In Vietnam war, dried Job's tears seeds were used as staple food. The seeds are either boiled or ground into powder for consumption through making various dishes. Flakes or powders of Job's tears added to different bath products, candy, drinks etc.
2. It is consumed in teas and other drinks. Job's tears tea is quite popular in Thailand and Korea, which is prepared by roasting followed by grinding of seeds into powder. In



China, the powder of Job's tears is mixed in water and sugar to make a sweet drink. In many places, it is consumed as desserts by mixing with milk. In Japan, vinegar is prepared from the seed of this crop. Sweet cocktails prepared from Job's tears are served in many bars of China and some other countries.

3. Due to its luxuriant vegetative growth, the young plant is cut and fed to the livestock to enhance productivity. In India, when grown wild, the green leaves of Job's tears are highly preferred by the wild elephants. Due to its quick regeneration potential the multi-cut fodder of this crop can be offered to domestic animals either as fresh or in dried as well as silage forms. The coix fodder contains 8.5% crude protein and 28% crude fiber (Poddaret *al.*, 2018). It is sometimes fed to livestock and poultry by mixing with molasses or concentrates. Even, the unshelled seeds can be used as poultry feed after grinding. However, coix fodder is highly palatable at its young stage as compared to later stages (coarse plant parts).
4. Wild species (*Coixlacryma-jobi* var. *lacryma-jobi*) of this crop has hard pearly white, polished, oval seeds (dyed or undyed) which are used for making Buddhist prayer beads, rosaries and necklaces, ear rings, finger rings, bracelets or other ornaments as well as decorative window curtains etc.
5. Job's tears beads are used in various musical instruments like Shaker's gourds.
6. Job's tears is widely used in medicine. Job's tears is famous in Chinese medicine and traditional Indian Ayurveda. Various parts of this crop (leaves, root and seeds) are used in preparation of medicine. In many places, Job's tears is used to cure hair fall, warts, whitlows, beriberi, bronchitis, dysuria, headache, hydrothorax, phthisis, pneumonia, small pox, strangury, osteoporosis, obesity, phlegm, abscesses of lungs and intestines, hay fever, cancer, cholesterol levels, inflammation, hypertension, arthritis, asthma, appendicitis, immunological problems, diabetes, rheumatism, menorrhagia, warts, urinary problems, puerperal fever, dysentery, chronic enteritis, intestinal parasites, tuberculosis, muscle and bone pains, swelling, pus build-up, congestion, eczema, diarrhoea and some other health issues. It contains chemicals which provide anti-oxidant properties and prevent the growth of bacteria and other parasites in body. Further, it has cooling diuretic effects. However, it needs scientific researches or trial on human body as most of the researches have been conducted on

animals. Tea prepared from leaves or seeds of Job's tears can stimulate ovulation in women in India. In China, Philippines, India etc., the seeds are utilized either as tincture or as decoction. However, it is advised not to consume Job's tears tea during pregnancy and lactation period.

Production technologies

Land preparation

Job's tears requires moist soil for sufficient germination as well as growth and development. Land should be prepared through deep ploughing, followed by 2-3 harrowing and levelling by planker.

Time and method of sowing

Except winter, the crop can be grown in any other time through broadcasting (mostly practiced) or line sowing. June is the most ideal month for its sowing. As the seeds have hard seed coat, to facilitate the germination, seeds need to be soaked in water for at least 1 day before sowing. Seeds are usually sown at 5-7 cm depth into the soil. Sometimes, transplanting of coix (generally, 30-35 days old seedling) is also done in low lying areas for better establishment.

Seed rate and spacing

30-40 kg/ha seeds are generally sown at the spacing of 40 cm×15 cm. In case of broadcasting, 25-30% more seed rate than line sowing is used.

Nutrient management

This crop responds well to nutrients. During land preparation, application of FYM or compost @10-12 t/ha is advised. Recommended dose of fertilizer for coix is 80:40:40 kg/ha (50% N, full P₂O₅ and K₂O at basal and remaining 50% N after cutting of the crop as fodder). However, it responds well beyond 80 kg N/ha (i.e. 120 kg N/ha) as observed by Gorne (2020).

Weed management

1-2 hand weeding at 20-25 and 40-45 DAS can eradicate weeds from Job's tears field. During weeding, soil is loosened which effectively help in crop establishment, growth and development.

Water management

In rainy season, it is grown as rainfed crop. However, during summer and after rainy season irrigation is provided at 15-20 days' interval.

Insects and disease managements



No noticeable insects and diseases are found in this crop. However, for better protection proper field sanitation and seed treatment are highly needed. Leaf spot, leaf rust, smut etc. are some diseases of this crop. Seeds are damaged by rats and parrots.

Harvesting and yield

The crop is cut fresh for fodder purpose at above 30 cm from ground. 2-3 cuttings can be taken per year with first cutting made at 45-80 days after sowing depending on the growth of crop and need, followed by subsequent cuts at 30-45 days' interval. Seeds are threshed and dried under sun before milling. 600-700 q/ha green fodder can be obtained from this crop. When Job's tears is cultivated only for seed purpose, 1.8-2.1 q/ha seed yield can be obtained depending on variety, agro-climatic condition and management. Yield of this crop varies among different regions and countries. In Mali, 45-53 t/ha fresh fodder, 3.5 t/ha seed yield in Philippines, and 2.1 t/ha seed yield in Sri Lanka have been reported from this crop.

Nutritional status (100 g seed)

Job's tears seeds contain 380 calories, 11.2 g H₂O, 18.2% albuminoids, 6.2 g fat, 65.3 g total carbohydrate, 1.5% fiber, 1.9 g ash, 25 mg Ca, 435 mg P, 5.0 mg Fe, 0.28 mg thiamine, 0.19 mg riboflavin, 4.3 mg niacin and 0 mg ascorbic acid and 29.9% dry matter (Kumar *et al.*, 2014). They are rich in protein and fat as compared to other cereals but contain less minerals. The seeds also contain one prolamin known as Coixin (rich in leucine and glutamic acid).

Conclusion

Due to multiple uses and benefits, Job's tears has great prospect to be grown as commercial crop in many places specially in uncultivated and marginal lands. Besides, in hilly tracts, this old, traditional plant specially has very high scope to be grown successfully. This crop has the potential to generate high income and employment. However, to make Job's tears as a successful crop, development of high yielding, short duration, dwarf, drought, frost and lodging resistant, synchronous maturing, high harvest index potentiated varieties through breeding approaches is highly needed. Researches are also required on traditional land races. Multi-locational research trials are also helpful along with proper demonstration through extension works. Further, focus should also be given on processing and value addition of this versatile crop.

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