

# Job's-tears (*Coix lacryma-jobi*)—a Minor Food and Fodder Crop of Northeastern India

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*Job's-tears*—a cultigen of great antiquity—is grown in South Asia mainly by the natives of various ethnic groups of Mongolian origin. The plant is used as a minor cereal and fodder. The northeastern region of India is a centre of variability for the genus *Coix*. It is considered that this plant was introduced here either by the pastoral Aryan invaders, who grew it on the slopes of the Himalayas or during Mongolian conquests when the crop got distributed from the eastern Himalayas to lower subtropical terrains.

During plant explorations conducted since 1970 in the northeastern region of India, much variability has been recorded for this crop. The various soft-shelled races now grown in this tract by the tribes are the result of conscious folk domestication and must have been selected for easy hulling and good kernel type. Based on this, and on information on domestication, cultivation and economic usages of this plant among the natives, some findings are presented in this paper.

Amongst the Oriental Maydeae which comprise the genera *Chionachne*, *Sclerachne*, *Trilobachne*, *Polytoca* and *Coix* (Bor, 1960; Kaul, 1973) native to India, Burma, China and Malaysia, only *Coix* or Job's-tears has gained importance as a minor economic plant (Uphof, 1968; Jain and Banerjee, 1974). As a cultigen, it is grown on a small scale by the tribes of various ethnic groups, chiefly on the hilly tracts of southeast Asia. The crop, however, is of great antiquity (Watt, 1904), and, before maize became popular in south Asia, the aboriginal inhabitants of Mongolian origin grew it on a much more extensive scale (Burkill, 1935, 1953).

The introduction of *Coix lacryma-jobi* as a cultigen in India is associated with the pastoral Aryan invaders (Hooker, 1848) who grew this crop on the slopes of the Himalayas, or with the Mongolian conquests when the crop got distributed from the east Himalayan belt to lower humid subtropical terrain (Watt, 1904). The plant was being grown in the remoter past as a minor cereal and has even been referred to as one of the staple crops of the northeastern region (Anon., 1898).

The genus *Coix*, well differentiated from the rest of the Maydeae by its fruit, which is formed exclusively from the hardened floral

leaf or the bract, has four species (Bor, 1960) of which *C. lacryma-jobi* is polymorphic and exhibits a race-forming tendency (Venkateswarlu and Chaganti, 1973). The wild and the cultivated forms occur in a similar ecological/phytogeographical range and various intergrading types are known. The following are some morphologically distinct forms of recognisable taxonomic identity (Bor, 1960; Jain and Banerjee, 1974).

1. *Cultivated types*. Fruit-case soft, usually thin-shelled, breakable, coarse, not shining, bold, occasionally exceeding 2 cm in diameter.

var. *ma-yuen*. Plants tall, annual, all soft-shelled types with above characteristics, fruit case of variable shape—pear-shaped to spheroidal.

2. *Wild types*. Fruit-case strong, hard and stony, unbreakable by hand, polished/shining, usually 1 cm or less in diameter, perennial forms.

var. *stenocarpa*. Plants akin to cultivated forms, but with coarser leaves, fruit as above, hard and stony, elongate-cylindrical.

var. *monilifer*. A variation of *stenocarpa* with more variable fruits; roundish types broader than long prevail.

The characters common to all forms are: "female spikelets completely enclosed in a metamorphosed leaf-sheath which takes the form of a bead-like structure varying from

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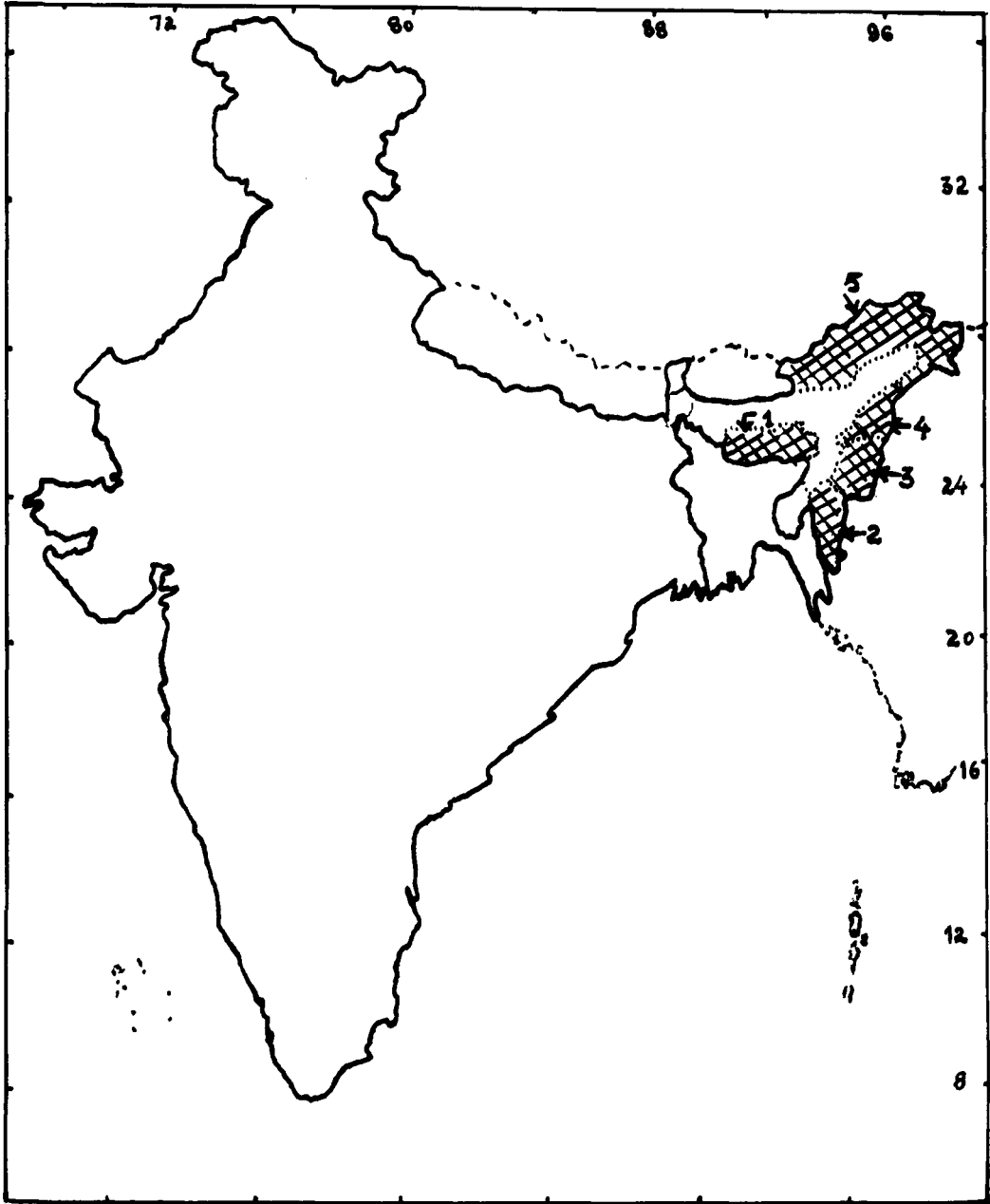


Fig. 1. The distribution of *Coix lacryma-jobi* in northeastern India. The region of variability in *Coix* includes 1. Meghalaya, 2. Mizoram, 3. Manipur, 4. Nagaland, and 5. Arunachal Pradesh.

ovoid to spheroid and exhibiting various colours.”

Of these types chiefly var. *ma-yuen* (cultivated type) and var. *stenocarpa* (wild type) occur in northeastern India. Figure 1 depicts the main region of their distribution.

During explorations conducted in the

northeastern region of India since 1970, much variability representing the currently grown types, as well as of the wild forms, was noted. Figure 2 depicts the range of variation in fruit type, shape and size. The fruit colour in the wild forms varied from whitish and greyish to greyish black; that in the cul-

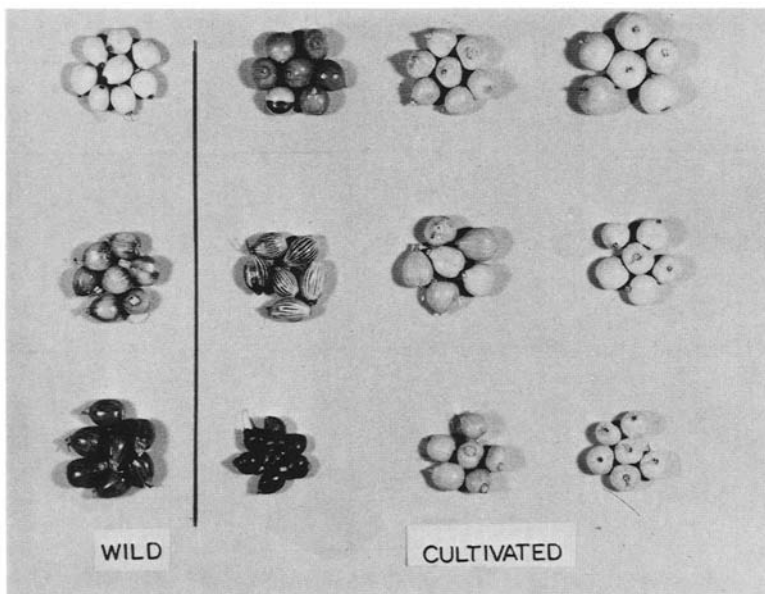


Fig. 2. Variability of grain types in *Coix lacryma-jobi*—in cultivated and wild forms.

tivated soft-shelled forms exhibited a wide range from whitish or cream to brown, grey or black—the grain shape varying from pear-shaped to elongated. More variability existed in the nonstriated types and only a few collections exhibited the striated forms. In all, over 90 accessions representing such types have been collected, mostly from Khasi, Jaintia and the Garo hills (Meghalaya), Ukhrul and other tracts of Manipur and the bordering ranges of Arunachal Pradesh and Nagaland and from the hilly tracts of Mizoram bordering Burma. Two representative soft-shelled types (striped and non-striped types) with thin shells and good kernel size are represented in Fig. 3.

Venkateswarlu and Chaganti (1973) suggested eastern India and Burma as the centre of origin of *Coix*, since the greatest multiplicity of the wild types of *C. lacryma-jobi* and of *C. aquaticus* (which it possibly resembles most closely) exists in this region. Vallaeys (1948) considered Malay archipelago, while Burkill (1953) pointed out Indo-China as the centre of origin. It is very possible that the northeastern tract of India, where rich diversity of wild and cultivated forms of *Coix lacryma-jobi* occurs, represents the Indian centre of diversity for this crop.

While in this region and possibly in Burma, which forms phytogeographically, a contiguous belt, the *Coix* crop got introduced as a cultigen, possibly by the pastoral Aryan invaders (Watt, 1904), the aboriginals who migrated from Indo-China to Malaysia about 1000 B.C. are said to have knowledge of cultivation of *Coix* and introduced it into this region along with crops like *Colocasia* (Burkill, 1953). The northeastern India and Burma, and the region of Indo-China, thus, are the two important regions particularly for the multiplicity of the cultivated races of *Coix lacryma-jobi*. These soft-shelled races of *Coix* originated possibly through gene mutation from the wild forms and/or must have evolved as a result of conscious folk domestication. Further these soft-hulled types must have obviously been selected for easy husking by the tribes for use as a cereal.

#### CULTIVATION

The crop is grown mainly in the rainy hilly tracts of the northeastern region and the adjoining parts. This region is largely occupied by tribes of various ethnic groups who raise different crops under the shifting cultivation system, locally called the *jhum* system. After the forest land is clear-felled of trees, bushes,

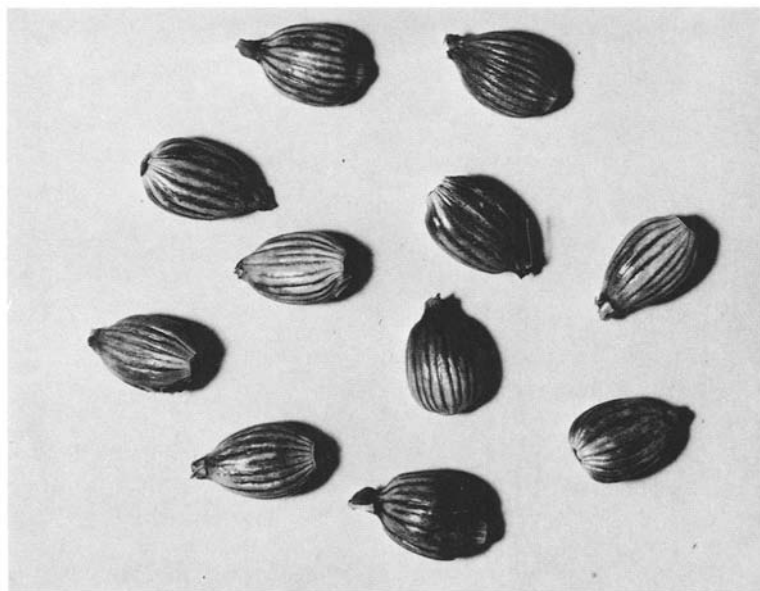


Fig. 3A. A representative soft-shelled form (var. *mayuen*) with striped shell.

etc., and burnt, and the litter mixed with the soil, such sloping or undulating terrains between 300–1,500 m are used for growing various kinds of crops by the tribes—*Colocasia*, chilis, brinjal, rainfed paddy, finger-tail and

fox-tail millets, maize and others. *Coix* is grown usually as an accessory crop (Fig. 4).

The *jhum* after hand ploughing/hoeing, is made ready for sowing by April, and by May the seeds of *Coix* are dibbled in. In pure-

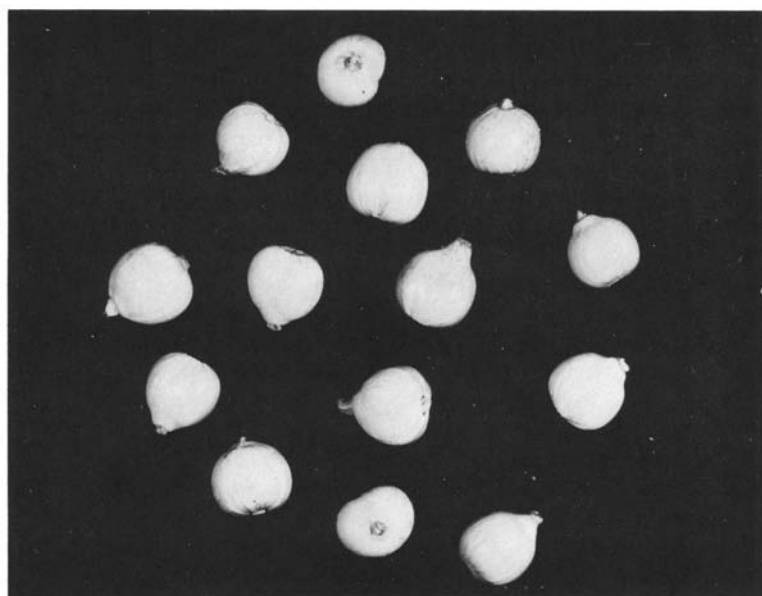


Fig. 3B. A representative soft-shelled form (var. *mayuen*) with non-striped shell.

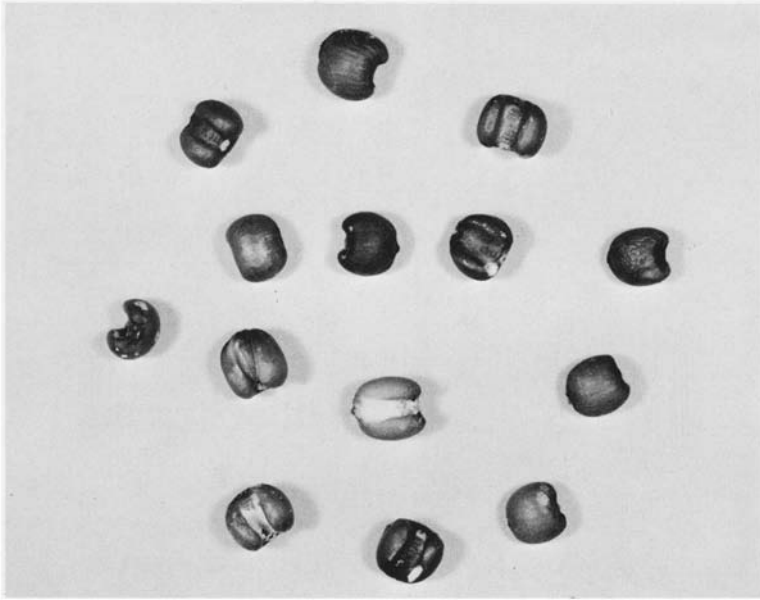


Fig. 3C. The de-hulled kernel ( $\times 1$  approx.).

patch cultivation, row to row distance is kept for maize, but when it is raised with other crops, seeds are dibbled in at random. It is often grown also along the borders of the fields with close spacing (ca. 30 cm).

All over this terrain, *Coix* is grown as an annual, rainy season (*khariif*) crop, being dependent chiefly on monsoon showers as are the other rain-fed crops, like the paddy. Usually, May–June showers accelerate the growth of the seedlings.

The crop grows slowly, taking well over four months to attain maturity. The number of tillers varies, but more than five tillers per plant are commonly seen (Fig. 4). Reports exist that as many as 50 tillers may occur (Venkateswarly and Chaganti, 1973). All tillers bear inflorescences which come into flower/fruit during September–October. When laden with mature fruits, the tillers droop down. The mature plant no longer is lush green like the younger plant; it develops greyish leaves, and at this stage is usually harvested. The plants are cut from the base, tied in bundles and carried to the tribal dwellings (invariably situated away from the *jhum* lands) for threshing. The threshed produce of the grains is spread on the mats or on floor and suitably sun-dried outside the tribal

huts (Fig. 5) and finally stored for home consumption.

#### ECONOMIC UTILITY

The sun-dried grains are stored in gunny bags and used in various ways by the tribes for food and fodder and even for personal adornment.

When taken as a minor cereal, the grains are first pounded. After de-hulling and winnowing, the kernel is separated and used as food. Generally, it is boiled like rice and eaten cooked, often with rice in 1:2 proportion. Occasionally, the pounded kernel is made into a thick paste with water and finally used for preparing a leavened bread: such usage is almost obsolete now. The pounded flour is sometimes also mixed with water and taken as such as a cooling drink like barley water. The more sophisticated among the tribes use the pounded kernel for making a sweet dish by frying and adding sugar. Often these tribes also eat the kernel out-of-hand after de-hulling it, since the raw kernel is quite sweet and tasty. This method of eating it resembles that of the peanut.

Another very popular use of Job's-tears by the tribes is the brewing of beer from the pounded grains. For preparing wine, *Coix*—



Fig. 4. *Coix lacryma-jobi* in Garo hills, Meghalaya (with *Colocasia*).



Fig. 5. The threshed produce of *Coix* grains being sun-dried by a member of the Garo tribe.

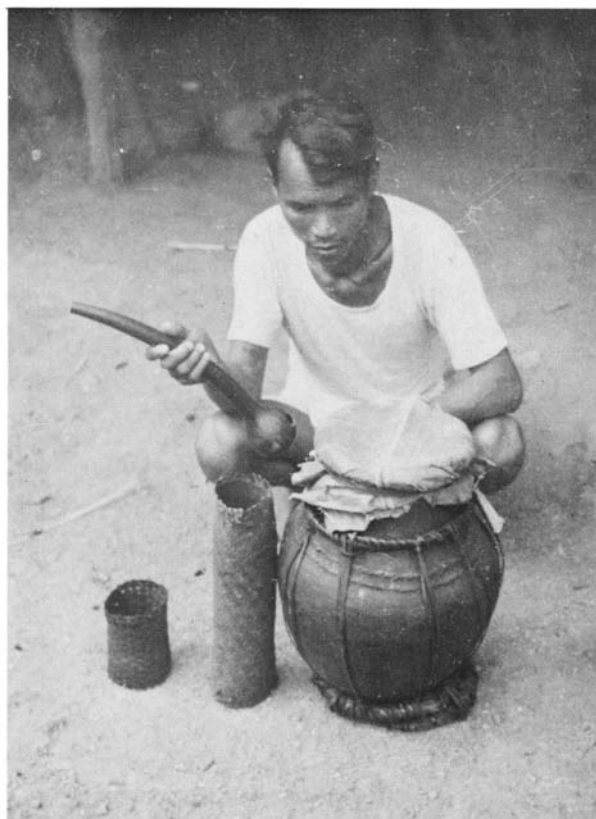


Fig. 6. Preparing of *Coix* beer by the Garo tribe.

locally called *magharu* (Garo hills), *Shoriew* (Khasi and Jaintia hills) and *mim* (by Nagas, Mizos, Manipur tribes)—is cooked like rice and later spread on a mat. With this is mixed a paste of rice (powdered and wrapped in a fern leaf called *chosanut* by the Garos, and kept for well over a week).

A wide-mouthed earthenware pot is taken and a perforated cylindrical structure made from bamboo matting and suiting the size of the pot is placed in the centre of the pot. The cooked *megharu* is put in this pot carefully, with the perforated cylinder held in position in the centre. The pot is now covered, plugged with a banana leaf (Fig. 6), and kept for a week or ten days, until fermentation takes place. The plugging is then removed, and water is poured into the fermented paste. Gradually, this water seeps through the perforated cylinder, mixing with the thick paste sticking to its sides. This concentrated fluid is now churned with a container made out of

*lau* (dried, hard, hollow *Lagenaria* fruit specially chosen to suit the size of the pot and the perforated cylinder). This fluid is then sipped through the thinner edge of the *lau* fruit (Fig. 7) by the tribals (the *lau* has two openings, the other being in the broader basal portion from which the fluid enters, shown by an arrow in Fig. 7). This process of brewing *Coix* beer was seen at Songsak in the Garo hills, Meghalaya. In Nagaland, this beer is popularly known as *Zhu* or *dzu*.

Apart from the utility of *Coix lacryma-jobi* as food and for brewing beer, its foliage, though coarse, is considered a fairly good fodder. The leaves can be used after threshing for silage. When left in piggeries, by trampling and mixing with mud, this makes a kind of compost (Arora, 1974). Dry leaves are also used for thatching (Jain and Banerjee, 1974).

The soft-shelled types are becoming popular now, also as a poultry feed. The chicks

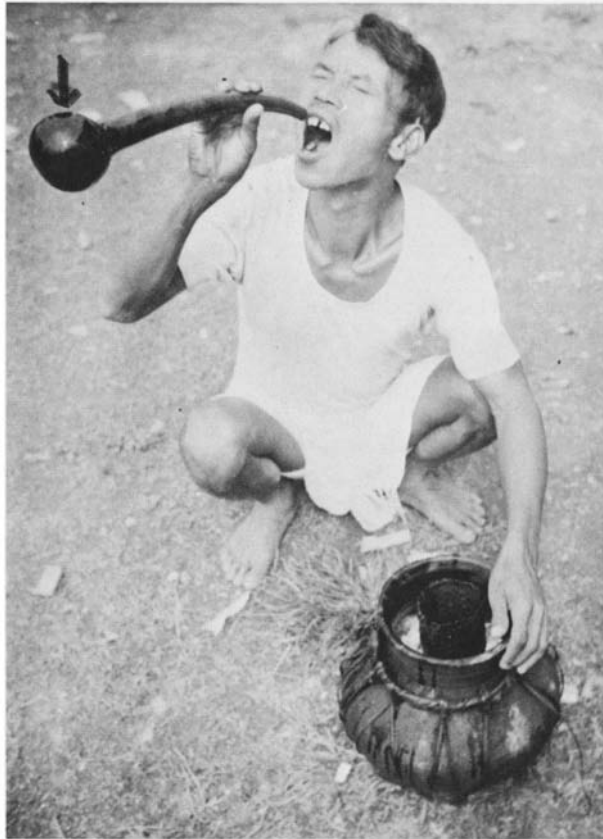


Fig. 7. Preparing of *Coix* beer by the Garo tribe.

de-hull the grain and eat the sweet kernel; it was observed in Khasi hills of Meghalaya and Ukhrul ranges of Manipur bordering Burma.

All the above uses refer to soft-shelled cultivated forms, and their utility is confined almost to the natives or tribal inhabitants. To the western world, *Coix* has been more familiar for its colourful, glossy, shining beads used for making pendants, necklaces, etc. The local tribes, particularly women, also adorn themselves with these white/grey/black shining beads—collected locally from the wild forms.

#### GENERAL CONSIDERATIONS

This account sums up observations on the economic utility of *Coix lacryma-jobi* by the northeastern tribes and high lights the nature of variability available currently in this area. Since all of this tribal region is now in the

wake of agricultural, industrial and socio-economic chaos, it is of utmost importance that the diversity in this minor crop should be conserved for future use of plant breeders, agronomists and other botanists. Though its potentialities as a cereal have been well attempted (Watt, 1904; Wester, 1920; Pierris, 1936; Vallaey, 1948; Schaaffhausen, 1952), its low yield and slow growth have retarded its popularity in comparison to rice and maize (maize now occupies the areas where *Coix* was once grown). However, much potential has been anticipated for this crop as a fodder. It has been pointed out that the chemical composition of the hay of *Coix* is similar to other graminaceous crops. Improvement of this crop as a fodder with high yield ability has been the focus of study by Japanese scientists, and several breeding programmes have been carried out and potentially useful material screened out



(Murakami, et al., 1963). However, it has been pointed out by these workers that in the full-scale development of *Coix* as a fodder crop several problems of cytogenetical and agronomic investigations still remain to be tackled. Since the crop does not require the care normally needed to grow rice and maize in this humid terrain, the ecological habitats particularly of the wetlands—humid subtropical belts where other crops may be difficult to raise, could support this crop satisfactorily. Future studies may reveal ecotypes suitable to waterlogged habitats, where this too could be grown as a fodder crop.

#### ACKNOWLEDGMENTS

I express my gratitude to the State Agricultural Departments of Meghalaya, Manipur, Arunachal Pradesh and Mizoram for help provided in the collection of *Coix* material during explorations conducted to these tracts since 1970. I am particularly grateful to Shri M. W. Hardas, Head, Division of Plant Introduction, and Dr. S. K. Jain, Deputy Director, Botanical Survey of India, Shillong, for going through the paper and suggesting suitable modifications.

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