
A BRIEF ACCOUNT OF *Crotalaria*.

The word "Crotalaria" is a Greek word "KROTALON" (a child's rattle) appear in Linnaeu's species plantarum (1753). Crotalaria is one of the 43 genera in the tribe Genisteae of the sub-family Papilionatae. The largest genus among these genera is Crotalaria with about 550 Sps (Polhill 1968). It is further subdivided into 10 spetions on the basis of habit, leaf, stipule, calyx and pod characters and also on number of seeds in a pod.

About 80-90 species have been reported occuring in various habitats (plains to 2438 meters) of both nothern and southern India. Only Baker (1876) under took the floristic work in British India (then including Burma, Cylon and Pakistan) and he recognised 77 species in 10 sections of the genus Crotalaria occuring in our soil in Hookers "Flora of British India" 1876. Cook (1903) in his"Flora of Bombay Presidency" has described 32 species without considering any sections and later Gamble (1935) in the "Flora of the presidency of Madras" which own the major portion of S. India includes 75 species of Crotalaria in 8 sections.

Genus Crotalaria is growing in different regions of the world under different biotic and climatic conditions. It has a wide distribution in tropical and sub-tropical regions of the globe. The primary centre of

distribution for the genus is Tropical Africa though India serves as a secondary centre of distribution from where certain species have migrated to Malaya and Australia. Crotalaria can adopt to varied ecological situations but prefers acidic soils. If they are grown in odd seasons like, summer, growth will be very much stunted with few flowers.

Several species of Crotalaria are economically important and many carry genes for resistance or immunity to many diseases and insects pests and also possess unexploited reserviors of genetical variation which have a promise of high potential value if transfered to cultivated species, especially Crotalaria juncea. Many species are important because of forage and cover crops (C. mucronata, Desv., C. angulata Mill.,C. maritima cham.,) alkaloids (C. juncea), medicinal (C. barhia, C. prostata, C. verrucosa, C. albida) and fiber yielding (C. juncea, C. brownei and C. retusa).

Importance of Crotalaria juncea L (Sunnhemp) : It belongs to family Leguminosae and sub-family papilionacea. It is cultivated in India since ancient times. The medicinal uses of Crotalaria was long back recognised in India in the vedic periods. The descriptions of Crotalaria sps. (C. verrucosa in Sanskrit known as "Sonapushpi", "Dhavani", "Vrihat pushpi" and C. juncea

as "Jenapavera", Pulivanji) are seen in the Ayurvedic books.

Sunnhemp remains second only to jute as the sub-continents source of bast fiber. Traditionally, sunnhemp has been considered a good fibre for manufacture of twine and cord, convas, fishing nets, mats, rags and sacks. But recent research has demonstrated its potential for pulp and paper. The bast fibre shows good pulping characteristics, yielding a pulp that appears suitable for a wide range of uses. Used in paper, it imparts high strength as well as scuff and tear resistance.

Because it is a legume that nodulates freely, sunnhemp grows on poor soils and requires little or no nitrogen fertilizer. Each year about 130,000 tons of sunnhemp fibre are produced (mainly in India, Pakistan, Brazil and Bangladesh) much of it for export to Europe or United States. However there has never been any significant plant breeding done on sunnhemp. Germplasm has not been collected and varieties with predictable qualities are not available; consequently , yields remain low compared with Kenaf, a nonlegume competitor for which cultivars exist. Yet sunnhemp is a crop that deserve research attention not only to benefit the countries and farmers that now produce it but also to enable its cultivation to expand in to new regions.

Sunnhemp is normally a shruby, many branched plant, but when it is grown in dense strands it has a single spindly stem that can be 3 m. tall. It is an annual that grows vigorous lateral roots and a long taproot that exploits subterranian moisture. On the root lets near the soil surface are produced many nodules that are well branched and up to 2.5 cm. in diameter. Although adapted to a hot climate, the plant will endure slight frost.

To obtain the fibre for cordage or textiles, the plants are traditionally processed in same way as jute. Bundles of freshly harvested stems (with the roots and tops cut off) are soaked in water for a week. During this time, micro-organisms decompose much of the soft tissue (a process called retting). The bark can then be peeled away and by repeated beating and washing, the fibres separated from it.

Sunnhemp textile fibre is whitish gray or yellow and comes in hanks 1-2 m. long. The fibre is reported to be more durable than jute and to have greater tensile. strength. The strength increases when wet and the fibre resists degradation caused by moisture mildew and salt water.

The cleaned cordage fibre represents about 8 percent of the weight of the dried stem, yields of 300-900 kg of dry fibre per hector are average, but researches in Brazil have obtained dry fibre yields of 2000 kg. per hector.

The high cellulose (45-60%) and low ash content of sunnhemp fibre has long made it a choice for cigarette and high grade tissue paper. The fibre is soft and only slightly lignified, it pulps readily and in high yield (53-54% by the sulphate process). Individual paper making fibres are 3.4-8 mm long and 13-50 μ wide cellwalls 6-7 μ thich. For large scale pulp and paper manufacture, the plant can be machine harvested and the whole stalk (containing both bast fibre and shorter wood fibre) can be pulped. The pulp has brushing and tearing strengths similar to those of commercial mixed hardwood pulp, but it has considerably higher folding endurance.

Sunnhemp is easy to grow. It thrives on almost any type of soil that is not water logged. It is easily established from seed. The seedlings appear above ground in about 3 days and rapidly produce a thick ground cover that smothers competing weeds. After planting, no care is needed untill harvest time. The complete mechanization of the culture and harvesting affers no difficulties.

When the seeds are planted inoculation is necessary, cow pea type rhizobia that nodulate sunnhemp are present in most soils. The roots nodulate freely and give adequate phosphate, one hector of sunnhemp can add upto 300 kg. of nitrogen to the soil. For this reason the plant is a valuable soil builder used even more widely as green manure than a fibre crop. As manure, the plants are ~~plowed~~ buried into the soil when 2-2.5 months old (they decompose more rapidly at this young age). Green matter yields of 18-27 tons per hector are average. In many part of the tropics sunnhemp is grown in rotation with rice, maize, tobacco, cotton and other crops. It is reported by Shelton (1980) about dry season legume forages to follow. Paddy-rice in North eastern Thialands. They also revealed about the soil fertility and planting method. It is sometimes grown together with sugarcane, pineapples and coffee or used as a cover crop in plantations and fruit orchards.

However, the importance of Crotalaria is increased ~~by~~ (Ersson, 1980) with large scale preparations of a Lectin from the sunnhemp seeds. Ramkrishnan et. al., (1981) analysed amonoacids in seeds of some Crotalaria sps.

Limitations :

The lack of both a systematic germplasm collection and of a classification of lines is the major limitation

to be spread and more intensive utilization of sunnhemp. Partly due to the lack of cultivars, the growth of a stand of sunnhump is often not uniform, which contributes to low yield and weed competition. But even the best plants now available yield less than competing crops such as kenaf.

Available sunnhemp strains have a tendency to bend and break (lodge) when the plants get tall. This complicates the harvesting. Although the plant grow vigorously on almost any soil, in heavy clay the fibre produced is coarse and its yield low. As the fibre crop sunnhump should be grows on light, loamy, well drained soils.

Many disease organisms including viruses, fungi, insects and nematodes have been found on sunnhemp but seem to cause little economic damage. Soloman and Sulochana (1980) found tne translocation of southern sunnhemp mosaicvirus in C. juncea. Lin, et.al., (1982) reported cow pea severe mosaic virus on C. juncea in central Brazil, Pal, (1981) observed the leaf surface, micro fungi of non infected and rust (Uromyces decoratus) infected sunnhemp. Mathur et al., (1981) found two new leaf spot diseases of C. juncea caused by Colletorichum dematium. Effect of phosphorus and potassium on diseases development in sunnhump was shown by Pal and Basu (1980). In India, a few, such as wilt and caterpillars of the sunnhemp moth, Utetheisa pulchella can

become a problem. serious. In Brazil, the only disease affecting the crop is a fungus Ceratocystes fimbriata. If it becomes too severe, sunnhemp fields are followed or planted with other crops for 3 years.

Although sunnhemp will grow in warm temperate regions, most varieties set seeds only in tropica and subtropics. This latitude dependance means that any breeding or seed production must be done outside the temperate zone. The dried leaves and stems are fed to cattle, but the literature contains conflicting statements on the forage value of fresh sunnhemp foliage. Under some conditions it seems to become toxic. Ghosi et al., (1981) observed the changes in pulmonary structure and function induced by monocrotaline intoxication, Sotelo, et al., (1980) found the chemical composition and toxic factors content of 16 Leguminous seeds out of which Crotolaria is one.

Research needs:

Sunnhemp will never realize its world wide potential until a comprehensive plant breeding programme is mounted. There is variability among the lines found on the Indian subcontinent and they need to be collected, compared and classified. Improved types suited to specific localities need to be selected. The plant breeders targets should be to select for high fibre yield, early maturity, stronger stems and resistance to disease.

Expermentation is also needed to determine more precisely the environmental and cellular requirements of crop. Harvesting and handeling methods need improvement. End-use applications need further testing and the economics of producing the crop should be analysed.

Given research, sunnhemp may prove to be a useful forage, it grows fast, can yield two crops a year (if cut 30 cm from the ground), and in India has out-yielded alfa alfa (Lucerne). In South Africa, sunnhemp has been fed to cattle at levels of about 10 percent of the diet. But as already noted, sunnhump appears to be mildly toxic under some conditions. Research is needed to identify the toxins, their effects and their means of detoxification. It is also important to identify which parts of the plant are toxic, as well as varietal, seasonal and environmental differences in toxin levels.

In the present investigation, the mutation aspects are taken in to consideration. There are many physical and chemical mutagens which bring about mutations, some of them will be economically important for which screening is necessary. Therefore in the present investigation the effect of γ-irradiation and diethyl sulphate on different parameters of Crotalaria juncea L. is studied. The prime importance is given to the nitrogen content, as sunnhemp is mainly used as a green manure in Kolhapur and its surroundings. Attempt is made to find the

suitable doses of the mutagens to get the beneficial effects. Alongwith nitrogen content, other aspects like germination percentage, biomass, chlorophyll content etc. are also taken into consideration.