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DIVERSITY DISTRIBUTION AND ETHNOMEDICINAL RELEVANCE OF *PSORALEA CORYLIFOLIA* L. IN TRADITIONAL HEALTH CARE IN INDIA

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Psoraleas, distributed throughout tropical and sub-tropical regions of the world, represent more than one hundred species. In India, *P. corylifolia* L. is widely distributed from Rajasthan to Bengal and from Punjab to down south Indian states. In indigenous system of medicine, this plant is highly recommended against leprotic syndromes, apart from this medicinal siginficance, the herb is also useful in alleviating other disorders of the body systems. Besides, its antibiotic and insecticidal potential, it may serve a good drug source against AIDS. Biotechnological advances have also been briefly discussed.

Key words: Diversity, distribution, ethnomedicinal relevance, *Psoralea corylifolia*

P. corylifolia L. (Purple fleabane), popularly known as *Babchi*, was earlier classified as a papilionaceous plant but later has been placed under the family Fabaceae. By mode of life form and habit, these plants are herbs, undershrubs and shrubs around 1-5 feet high, punctate with pellucid glands. Roundish heart shaped 1-3 inches long leaves have slightly inciso-dentate margins and are mucronate at the apex. Usually 1 to 30 flowers, composed of nearly sessile calyx and yellow corolla, bloom on the floral axis in racemes in winter and form small glabrous pods containing black indehiscent seeds in early summer. The plant besides its medicinal relevance, is a good source of nitrogen as feed to cattle and also serves as green organic manure.

Diversity distribution

Psoralea, comparatively a large genus has its wide distribution in tropical and sub-tropical parts of India and different centres of diversity in the world.

In Indian gene centre - Mainly four species of the genus have been reported to occur in India, out of these, one species is exotic i.e. *P. pinnata*, a South African shrub found around Ootcamund in south India. *P. corylifolia*, covering

its occurrence in most of the parts of the country, is abundant as a weed in Assam, Bengal, Bombay, Deccan, Rajasthan and Uttar Pradesh (Fig. 1) though reported to be rare in Orissa (Saxena and Brahmam, 1983). *P. plicata* has been reported to be distributed in the states of Punjab and Delhi. From Rajputana

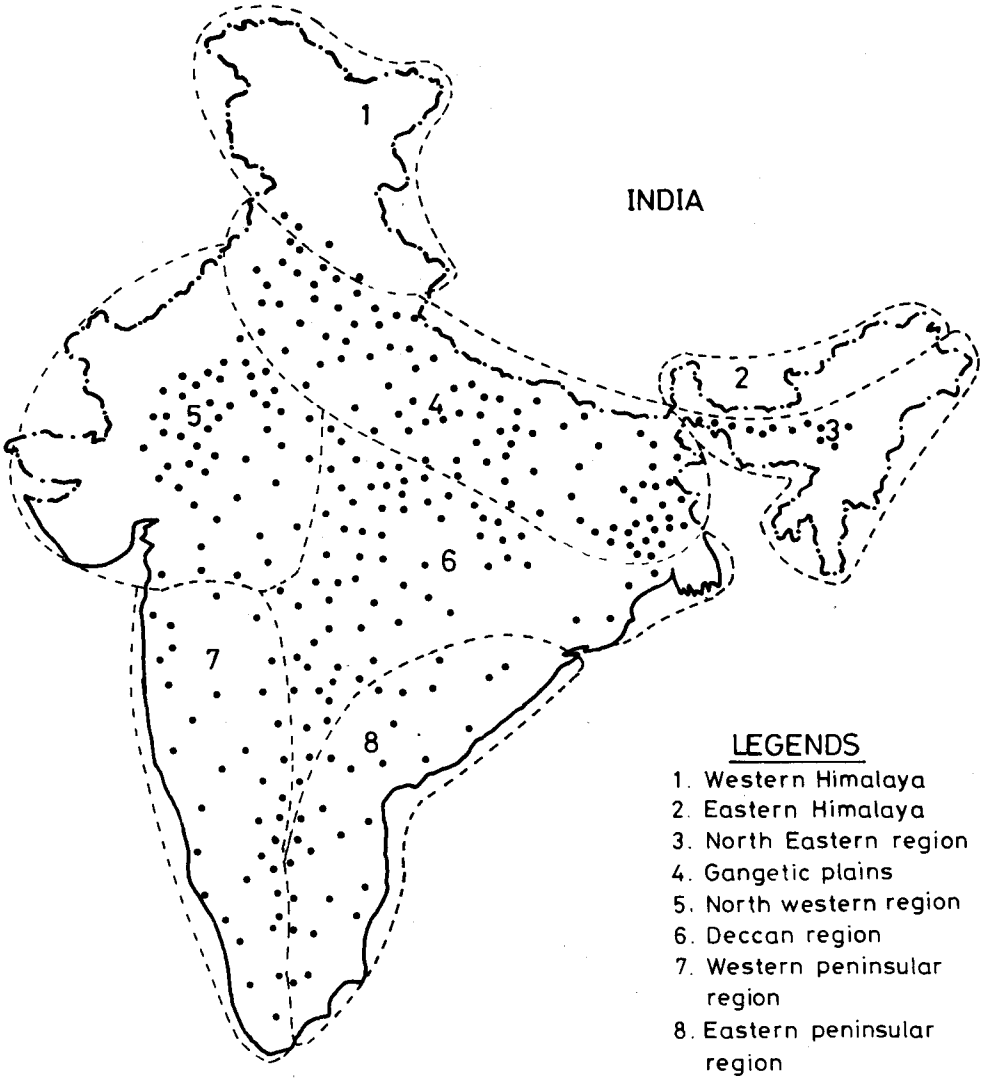

Fig. 1. Diversity, distribution of *P. corylifolia* in India

in 1918, *P. odorata* has been reported, however, few workers consider it as a synonym to *P. plicata* while others treat it as a seperate species. On the basis of collection records in various herbaria, literature and field survey, Pandey *et al.* (1983) reported *P. odorata* to be rare in Rajasthan.

In the world - Approximately 100 species of *Psoralea* have been stated to be distributed (Hooker, 1973) in both old and new world, however, Santapau and Henry (1984) reported about 130 species. Out of these, some species are *P. canescens, P. cinerea, P. corylifolia, P. glandulosa, P. holosericea, P. lachnostachys, P. leucantha, P. macrostachya, P. martini, P. obtusifolia, P. onobrychis, P. plicata, P. plumosa, P. postulata, P. sensu* and *P. stipulata*. Apart from these, Fig. 2(a and b) shows distribution of some other prominent species in various global megacentres comprising continental and sub-continental occurrence of the genus.

Secondary metabolites in *Psoralea*

The plant is endowed with effective biochemicals resulting from secondary metabolic pathways. Roots and seeds possess chalcones, flavones isoflavones, furocoumarins and other derivatives. Chief active principle of the seed is a straw-coloured, optically inactive essential oil, however, fixed oil, resin and trace of a substance of alkaloidal nature are also present. The alkaloid identified has been named as vernonine. Rangari and Agarwal (1994) carried out extensive quality control studies on *P. corylifolia* probably towards its refined herbal drug formulation.

Of many secondary derivatives, psoralen and bakuchiol are comparatively more important. Degradation studies by Banerji (1989) revealed that leucine, valine and iso-valeric acid contribute in the synthesis of bakuchiol for its phenyl propane and terpenic part. Cinnamic acid, P-coumaric acid, umbelliferone and marmecin are stated to form molecular backbone in the psoralen synthesis. The prenylation of umbelliferone leading to marmecin in *P. corylifolia* was reported by Innocenti *et al.* (1977).

Therapeutic potential

Almost whole herb is medicinally useful in indigenous system of medicine, seeds are very useful against various diseases and recommended as analgesic anthelmintic, antibacterial, antifungal, anti-inflammatory, aphrodisiac, diuretic, febrifuge, laxative and stomachic. Local healers, vaidyas and ayurvedic physicians prescribe it against leucodermic affections and psoriasis. Both oral ingestion and paste or ointment are being prescribed understanding the condition of ailment. Normally 1-3 *masas* or 5-20 grains comprise one dose but in the treatment of worm expulsion, the dose is 4-6 *masas*. The drug is so effective against leprotic syndromes that it has been reckoned as *Kushtnashini*

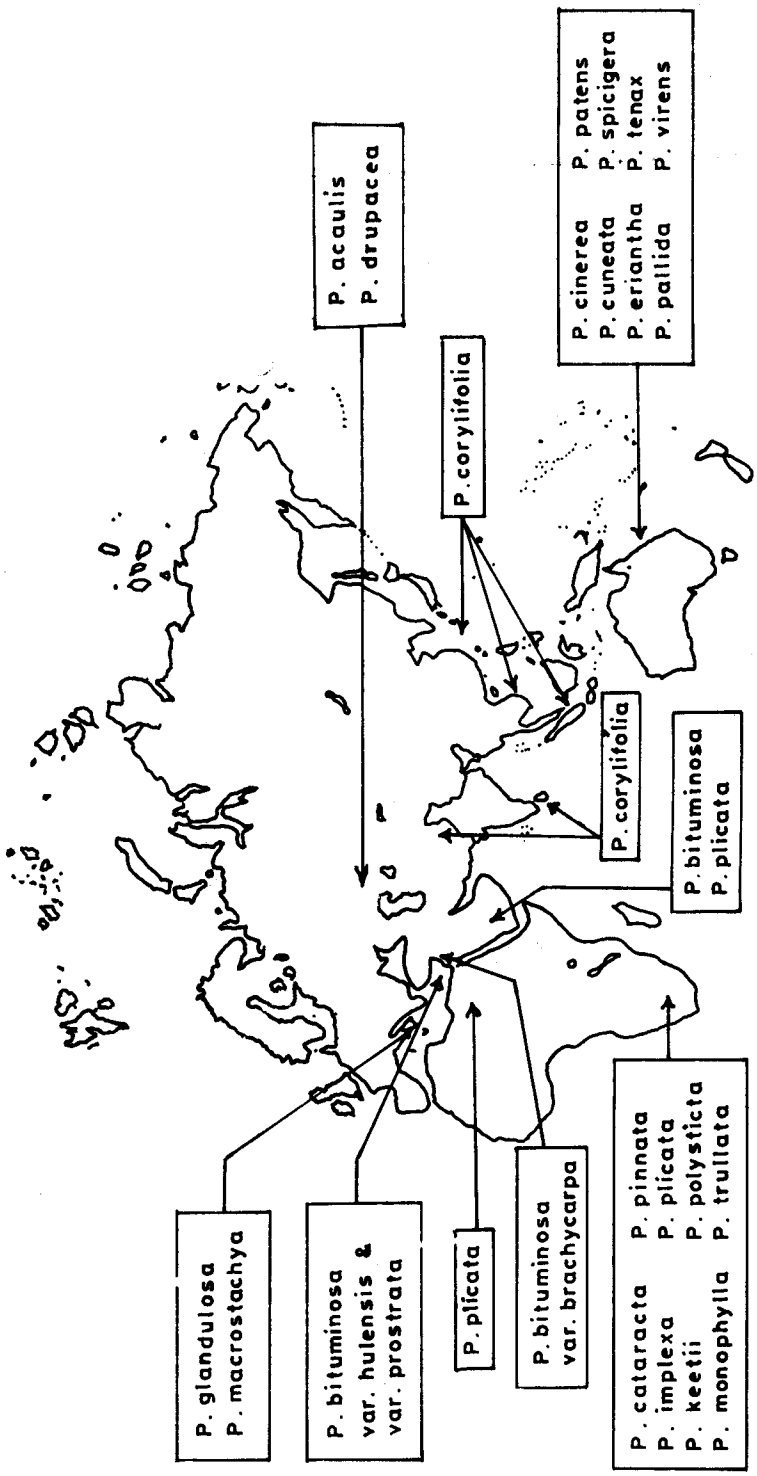

Fig. 2a. Global occurrence of some prominent species of *Psoralea* in Old world

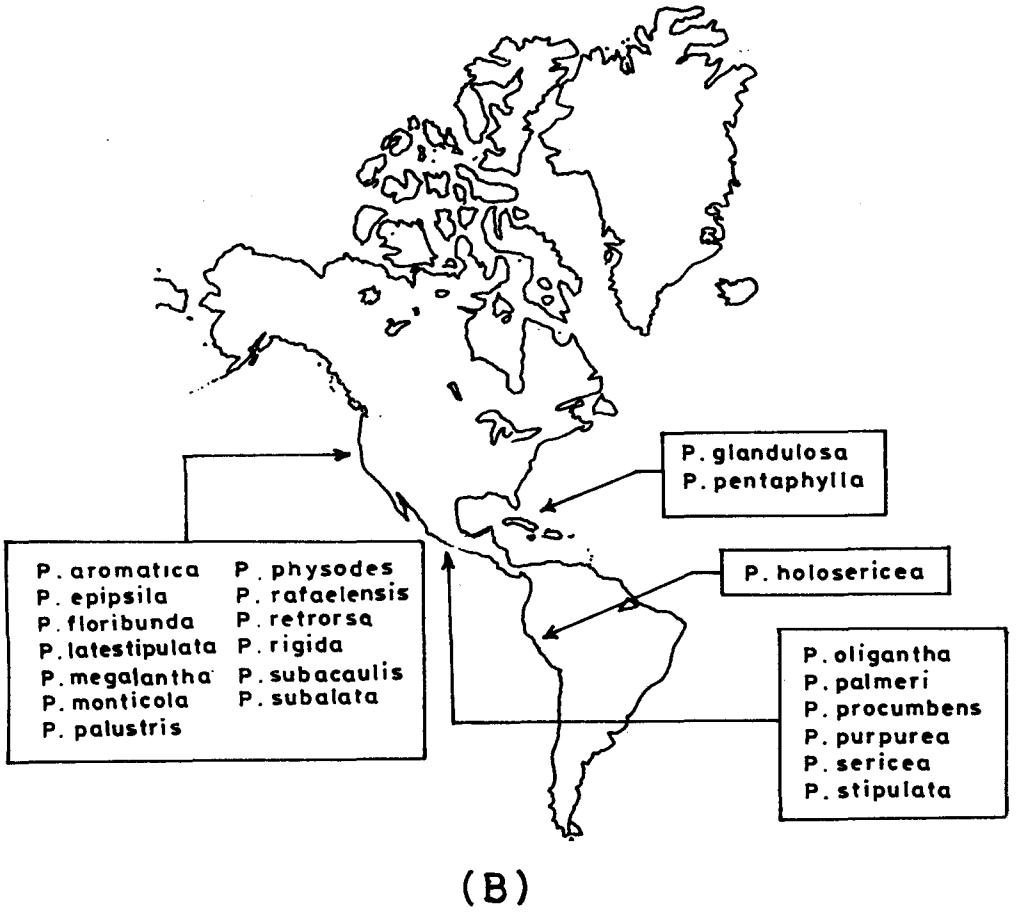

Fig. 2b. Global occurrence of some prominent species of *Psoralea* in New world

(Leprosy destroyer). Roots are useful in the caries of teeth while leaves are given in diarrhoeal cases. In scorpion sting, the herb is used orally as well as externally. Against *staphylococcal* infections, it has also proved its effectiveness.

According to Ayurveda the characteristic of pungency promises a good remedy to phlegm disorders (Kaph vikar) and plethora, also good for heart troubles urino-gential problems, scabies and elephantiasis. The plant is also used against the debility of the nervous system. Due to its alleviating properties in the disorders of digestive system like dyspepsia, constipation and liver disfunctioning, it is also known as Vakuchi (wind humour alleviator). Since it has stimulating property, thus, improves and maintains cardiac rhythmicity and swelling in the heart. In respiratory disorders like cough and asthma, its therapy is effectively used. It is one of the ingredients in the oil prepared for massage to alleviate physical sexual weakness. Besides these prophylactic

qualities, Unani system of medicine considered the seeds good for blood diseases, to improve appetite and as an aphrodisiac.

In U.S.A., *Psoraleas* have been recognised in therapy due to stimulating and nervine properties. In Sri Lanka, the seeds are ground with water and the preparation thus obtained is poured in both the nostrils to treat snake-bite, powdered seeds are also given orally.

Clinical characterization

Devraj and Bhutani (1994) studied the role of 8-methoxypsoralen from *P. corylifolia* in the treatment of vitiligo in 50 patients, and 26 patients of psoriasis. They found that the patients with psoriasis required treatment for a maximum of three months or it may slightly prolong in severe cases. Ancient phototherapy was combined with phytotherapy by Dolphin (1994) and it was observed that the psoralens after oral ingestion accumulated in the skin tissue and when activated by sunlight caused re-pigmentation of the skin.

The psoralen (PSO), a biochemical derivative from *P. corylifolia* was found to be cytotoxic against *in vitro* cultured human muco-epidermoid carcinoma cells of MEC-1 cell line. It inhibited the growth of MEC-1 cells by 79.1% which was as strong as pigyanmycin (PYM) (Wu *et al.*, 1992), thus, the plant may prove a good source of herbal drug against carcinoma.

Wall *et al.* (1988) isolated a number of known prenylated flavonoides from *P. corylifolia* and studied antimutagenic property. They concluded that most of the isolates were toxic rather than antimutagenic, but the activity of bakuchiol, a prenylated phenolic terpene, as an antimutagen did not show any toxicity.

Prophylaxis against leucoderma

In the case of syphilitic origin of leucoderma, the treatment with *Psoralea* oil is not recommended. But in the leucoderma of non-syphilitic origin, the oleoresinous extract is very popular in Indian pharmacopoeia as Babchi oil or ointment. While using crude oil extract from seeds, it is advisable to standardize and adjust the strength in such a way before application that it should not cause any reaction except the redness of leucodermic patches, though manufactured oil is available in the market. This is safe prophylaxis in comparision to oral administration of powdered seed and intradermal injections of essential oil. The oil is preferably better than other skin irritant agents like mercury salicylic acid etc. because it does not produce any change in the dermal tissues of skin.

Ayurveda considered *P. corylifolia* the only effective drug that has double action on the cells of dermal layers of skin. In leucodermic condition, the

melanoblastic cells do not function well and stop to secrete pigment. The oil effectively penetrates into the lymphatic tissues that causes on increase in plasma, and further it stimulates the melanoblasts that results to form and exude the pigment which on diffusion on decolourized areas starts developing normal colour.

P. corylifolia and AIDS

Secondary metabolites of the plants as tetragalloyl quinic acid, arjunolic acid, ellagic acid, β-sitosterol, gallic acid, castanospermine, calanolides, flavonoids, xanthones and polyphenolic compounds are being characterized for their anti-HIV activity. *P. corylifolia* have triggered new clinical research activities not because of its anti-leukemic properties but due to its possible therapeutic potential against the diseases of immune system such as AIDS, its bioactive principle may provide promising results (Duke, 1987). Since seeds of the plant contain essential oil, bakuchiol, resin, flavones and other derivatives, anti-HIV potential in the plant can not be ignored.

Antibiotic and insecticidal activities

Seed extract of *P. corylifolia* possess strong antibiotic potential causing growth inhibition of different *Staphylococcus* strains as *S. albus, S. aureus and S. citreus*. The skin affection of *Streptococci* and *Paramecia* can be best treated with the essential oil derived from the seeds. Other bacterial strains even resistant to penicilline do not withstand the extract application. Chadha (1986) reported insecticidal (antifeedant) activity with in *Psoralea*. In the roots of *P. corylifolia*, Chintalwar *et al.* (1992) also found antifeedant potential.

Agrotechnological aspects

In India, the plant is found in weed form, its cultivation at commercial scale is not probably anywhere except stated to be cultivated to some extent in Rajasthan and eastern districts of Punjab. The plant grows well on any average soil and the sowing is performed in lines at the rate of 7 kg per hectare during March-April. Good quality of seeds are produced in Rajasthan. The seeds have staggered germination thus, pose a problem in getting suitable biomass and reproductive yield. This problem can be overcome by *in vitro* strategies, all the same good quality of genetically stable, disease free plantlets may be obtained.

Germplasm seed conservation

Psoralea germplasm seed exhibit orthodox nature hence the same can be conserved by drying the seed to 5% moisture, sealing in moisture impermiable

containers and storing the same in cold room modules at –20°C. Out of a total collection of 40 germplasm lines being maintained at NBPGR, 10 accessions have already been conserved for long term in the National Gene Bank.

Biotechnological advances

In France, the hairy root cultures of *Psoralea* were attempted by Nguyen *et al*(1992) in eight species but later concentrated their studies on *P. lachnostachys*. *Agrobacterium rhizogenes* a naturally occurring pathogenic bacterium for plants, was used for raising hairy root cultures. Transformed roots were healthy and grew rapidly in Gamborg B5 liquid medium with a doubling time of 38 hours. Psoralen and angelicin, usually found in the roots of the plants raised in soil, could not be detected in the transformed roots which indicates that these furanocoumarins are translocated from aerial parts of plants to roots. The pathways of translocation of these metabolites need to be studied in detail.

Considering the problematic seed germination resulting in the decreased plant stand and its exploitation in pharmaceutical industry, the micropropagation studies have been undertaken at National Plant Tissue Culture Facility. The *in vitro* raised *P. corylifolia* plants were successfully transplanted in the soil. The plants showed luxuriant growth in the soil conditions.

In future, modern techniques of plant biotechnology like RFLP, RAPD and gene cloning may be fruitful in identifying gene sequence for antifeedant activity of the plant and engineering insect resistant transgenics in crop improvement programmes.

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