



आक्रामक खरपतवार

वर्ष 2006-07 में आयातित गेहूं के साथ प्रविष्ट

विदेशी आक्रामक खरपतवारों का विस्तृत वर्णन
Detailed Description of Alien Invasive Weeds
(Introduced along with Imported Wheat during 2006-07)



राष्ट्रीय आक्रामक खरपतवार निगरानी कार्यक्रम
National Invasive Weed Surveillance Programme

राष्ट्रीय खजानाक विज्ञान संस्थान भौति नहारापुर झज्जूर
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Maharajpur, Jabalpur (M. P) 482004 India



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Detailed Description of Alien Invasive Weeds
(Introduced along with Imported Wheat during 2006-07)



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National Invasive Weed Surveillance Programme

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National Research Centre for Weed Science

Maharajpur, Jabalpur (M. P.) 482004 India

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3-	I kbuk ^{Nykl} e vkQhl usy <i>Cynoglossum officinale</i>	11 14
4-	I kyue djkfyuHl <i>Solanum carolinense</i>	16 20
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Preface

Government of India has imported 6288890 metric tones of wheat due to scarcity in our country during 2006-07. This wheat has been imported from Russia, Australia, Canada, Hungary, Europe, France, Argentina, Romania, Neather Land, Kazakhstan and Bulgaria. This wheat has been distributed to poor people through public distribution system in Tamil Nadu, Andhra Pradesh, Kerala, Karnataka, West Bengal, Maharastra, Gujarat, Orissa, Madhya Pradesh and Chhattisgarh.

Along with this wheat many types of weed seeds have also entered in our country. Among alien weeds *Ambrosia trifida*, *Cenchrus tribuloides*, *Cynoglossum officinale*, *Solanum carolinense* and *Viola arvensis* are mainly found in imported wheat. Apart from these weeds *Avena fatua*, *Phalaris minor*, *Echinochloa spp*, *Rumex dentatus* and 25 types of other weeds seeds were also found. The consumers throw the wheat screenings containing the seeds of these weeds in compost pits or any other places. Under suitable climatic conditions the weeds are spread in the ecosystem, and they suppress the exiting plant species and establish there, compete with the native species and gradually harm them. When these alien invasive weeds enter in our fields, compete with crops and utilize the nutrients, light, air, water and space depriving the crops, causing drastic reduction in crop yield. Farmers have to spend more for control of these weeds resulting in increased cost of cultivation.

Our fields are highly infested with the earlier introduced weeds viz., *Phalaris minor*, *Avena fatua*, *Parthenium hysterophorus* etc. *P. hysterophorus* spreads epidemically in all seasons. The fallow lands and forest areas are also affected by this weed. The economic grasses and other species which are grazed by our pet animals are reduced and every where *P. hysterophorus* is seen. In forests *Lantana camara* has highly spread due to which the regeneration of useful grasses, medicinal herbs and timber species have reduced to the greater extent. In vacant lands *Lantana camara* is spreading continuously. The native species are affected due to these alien weeds and some of them are at the verge of extinction. Hence, it is essential to control the invasive weeds timely and check the dissemination so that native economic species and yield of agricultural crops may not reduce.

National Research Centre for Weed Science requests to all the consumers of the imported wheat, not to throw the screening of imported wheat, but burn all the screening along with the seeds of alien weeds. If these weed seeds are thrown in the compost pits / garbage they will spread in the crop-fields and other vacant lands. These alien weeds will affect our ecosystem and in future we have to face several problems. Education Institutions, Departments of Agriculture, Horticulture, Forests, Revenue, Gram Panchayat, Food Inspector, Fair Price Shops, Co-operative Societies, NGOs and Intellectuals are requested that in the interest of nation create the public awareness to control these alien invasive weeds, so that these weeds could not spread in our country. Where ever these weeds are seen growing, they must be uprooted immediately before flowering and fruiting. Farmers should not allow to grow these weeds in fields as well as bunds and grazing lands, they should be eradicated immediately.

The biology, ecology and control methods of alien invasive weeds are described in brief.

Dr. Jay G. Varshney

Director

NRC, Weed Science, Maharajpur, Jabalpur

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Ambrosia trifida (GIANT RAGWEED)

Ambrosia trifida L. (Gaint ragweed)

Syn *A aptera* DC., *A triata* Rydb. *A variabilis* Rydb.

Family :-

Asteraceae

Distribution :-

It was introduced to British Columbia, Canada (1985) and Kazakhstan (1975). *A.trifida* is a noxious weed in California, Delaware, Illinois and New Jersey, USA and a quarantine weed in Poland and Russia, Origin is USA

Biology**Habit :-**

Annual herb & or small shrub, 1 to 4 m tall.

Regeneration :-

By seed, seed germinate at 8 °C to 41°C temperature.
Optimum 10-24 °C

Root :-

Taproot system, short, many branches.

Stem :-

Erect, single or branching above, coarse, tall, thick, fleshy longitudinally black lined, woody at base.

Leaves :-

Petiolate, leaf blade deeply divided in to 3 lobes, margin serrated, opposite, broad, 6-35 cm long, sparsely covered with minute stiff hairs.

Inforescence :-

Head

Flower :-

Pedicillate, monoecious, small, green, nodding, consisting of a receptacle, a number of small round florets. Staminate heads 2-5 mm in diameter, phyllaries fused, cup like, 3 longest lobes blackish along the mid-veins in terminal spikes. Heads composed of staminate (male) or pistillate (female) disc florets. Pistillate heads are clustered in the leaf axils below the spikes, phyllaries fused, persistant, enclose a single ovary.

Fruit :-

Bur-like, obovoid, 6-12 mm long, warty, single achene, stoutly blunted beaked (beak 1 mm long) at tip. , brown to gray. Beak surrounded by crown of 5-8 short, thick, blunt teeth.

Seed :-

Achene 6-12 mm long, brown to gray with single small seed. Pointed crown present unless damaged, single plant produces about 275 seeds.

Ecology :-**Habitat :-**

Occurs in rain fall zone, prefers moister soil with summer rainfall, found in all type of soil and in disturbed habitats, river, villages, meadows, road sides, waste lands, pond margins, occasionally in crop fields, open areas.

Season :-	Rainy Season
Growth :-	Robust growth, prolific production of seeds with long viability.
Flowering :-	August-October
Fruting :-	August-October
Seed dispersal :-	By tillage, wind, water, through important export of seeds / food grains
Introduction potential :-	It is introduced through seeds/food grains in different countries. The <i>A.trifida</i> weed seed contaminate the harvested seeds, men move seed from one place to another, flood water and wind also help in spreading.
Establishment potential :-	Often found growing in sandy alkaline region in open habitats in non saline soils. It has habitat selection potential and selective mortality imposed by different habitat patches. Highly adaptive to different environments; establishment potential of this weed is very high.
Spread potential :-	It spread primarily by root stock and secondary by seed. Dispersal agents are tillage, wind and water from mother plant, spread potential is noted High.
Potential economic impact :-	In crop field <i>Ambrosia trifida</i> utilize large quantity of nutrients and cause reduction in crop yields, pollen grains cause hay fever, followed by allergic rhinitis and bronchial asthma, cause discomfort world wide.
Potential environmental impact :-	It compete with natural vegetation and has negative impact on environment, crop production, live stock production, human health, native flora, animal/plant products, trade, tourism and international relations.
Risk :-	High risk due to direct and indirect economic impacts.
Control :-	This weed is very competitive and is very difficult to control in many broad leaf crops. In the crop fields it can be controlled by hand weeding before flowering. The pre-emergence application of bromacil, prometrone and tebuthiuron, while post emergence application of glyphosate, Imazethapyr and 2,4-D are effective for control of this weed in non cropped area. In cereal crops it can be controlled by post emergence application of 2,4-D.

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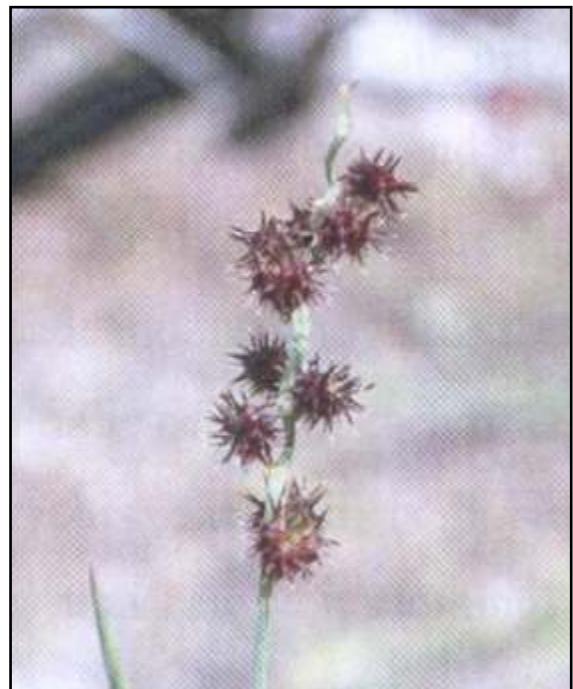
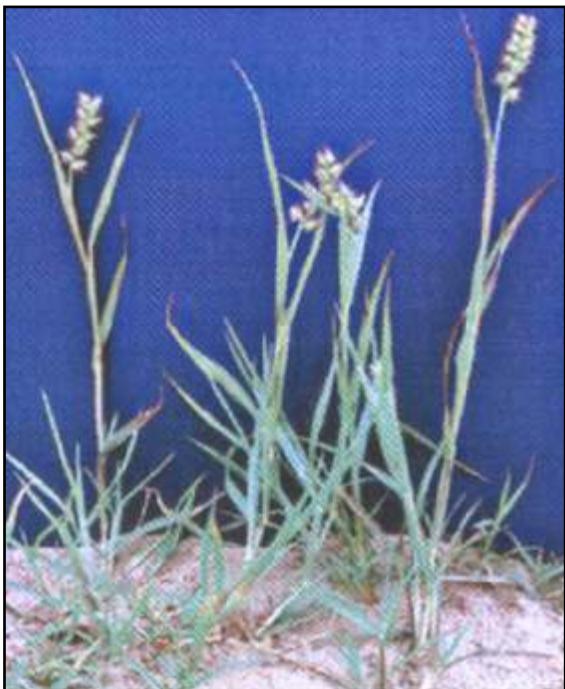
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***Cenchrus tribuloides* (SPINY BURR GRASS)**

Cenchrus tribuloides

(regulated weed schedule VIII of PQ.)

It is known as Sanddune sand bur, sand bur, grassbur, spiny burgrass and sandbur.

Family :-	Poaceae
Distribution:-	USA, Australia, Brazil, Bahamas, Bermuda, Cyman, Islands, and Cuba
Biology:-	
Habit:-	Annual grass with loosely tufted clump of tillers has nodes and internodes.
Regeneration:-	By seed
Roots :-	fibrous root system
Tillers/ Clums :-	Prostrate to erect 10-90 cm tall, may root at the lower nodes.
Leaf :-	Leaf blade 6-18 cm long 3-8 cm broad and taper towards tips. Leaf base has both ligules and auricles, leaf edges are smooth, surface slightly rough. Leaf lamina-linear
Inflorescence :-	Spike of burr- like spikelets along a zigzag rachis. Each bur, globular, 7-14 mm across, and covered with 3-7 mm long sharp radiating, spines that catch on clothing.
Flowers :-	Incomplete, bisexual, panicle axis angular smooth or scaberalous, bearing deciduous spike-let clusters. Panicle linear, dense, or loose (inter nodes 3-10 mm), 2-8.2 cm long, 1.5-3 cm wide. Based sterile florets barren with palea. Lemma of lower sterile, floret ovate, 5.5-7.5 mm long, 0.8-0.9 mm length of spikelet, membranous, 3-7 veined, acute. Fertile lemma ovate, 6-8.7 mm long, margin flat. Lemma apex obtuse. Palea coriaceous. Anthers 0.8-2.8 mm long.
Burrs :-	The spikelets consist of burrs.
Seed :-	Burr is called as seed unit caryopsis..

Ecology

Habitat :-	Lawns, fields, pasture lands, waste grounds, prefers sandy and moist soil.
Season :-	Warm season / rainy season.
Growth :-	From early mid May

Flowering :-	July - October
Fruiting :-	September
Seed dispersal :-	Cattle, sheep and clothing due to spines in seed unit, irrigation, flood water, through soil, food grains / seeds, wind.
Introduction potential :-	Very High. Entry through wheat grain from Australia to India distribution in PDS. during 2006-07
Establishment potential :-	Can establish in humid tropical and tropical climatic regions, as it has been established in Brazil.
Adaptability :-	Vide range of adaptability in various soil types.
Spread potential :-	Seed is well equipped with dispersal mechanism; it can be spread all over India. Spread potential is rated as Very High.
Potential environmental impact :-	Impact on biodiversity by reducing plant vigour, fire hazards increase in forests. On assumptions potential impact is rated as medium.
Potential economic impact :-	Inspection is reported in cotton, pulses, sunflower, vegetables and horticultural crops apart from wheat in Australia. In threat area these crops are available. The spines have minute barbs, which can break off under the skin and become quite painful to human being and cattle. The barbs may reduce the value of the wool.
Control :-	Specific control methods for this species are not available. This weed can be hand weeded, as and when appeared in the area. Heavy grazing prior to flowering. Nonselective treatments with glyphosate 0.75 -1.5 kg/ha, diuron 2.7-7.5 kg/ha, bromacil 5-6.2 kg/ha, benefin 3.5-4.0 kg/ha, and fluazifop-butyl 0.25 - 0.375 kg/ha as post emergence are effective.

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***Cynoglossum officinale* (HOUND'S TONGUE)**

***Cynoglossum officinale*. L.(hounds tongue)**

Syn *C. hybridum* Thuil, *Lindelia spectabilis*

It is also known as beggar's lice, dog's tongue, dog bur, sheep lice, common bur, glovewort and wool mat. It is a regulated weed under schedule VII of PQ.

Family :- Boraginaceae

Distribution :- The native of this weed is Eurasia and it is known to occur in North America (Canada and USA), Europe (France, Germany, Hungary, Italy UK etc) and Asia (Iran, Kazakhstan, Turkey etc.).

Biology :-

Habit :- It is an erect biennial herb of 1.3 m tall and very hardy. Plant often emit a musty odour.

Root :- Taproot system, thick, black, long woody upto 1 m.

Stem :- Erect, clothed with hairs, stout, rigid, branching near the top, 30 to 90 cm tall

Leaves :- Petiolate, upper most leaves appearing sessile and almost clasping. The shape of basal and lower leaves are oblong to oblong-lanceolate tapering to a long petiole-like base, leaf blade softly pubescent, margin entire, shape look like the shape of dog's tongue 7-30 cm long forming rosette.

Inflorescence :- In first year hounds tongue form the rosette. During the second growing season an elongated raceme emerges which bears flowers.

Flowers :- Calyx sepals 5, corolla-petals-5, bright purplish red. Flower broadly funnel form in shape, stamens 5, pistil deeply 4 lobed, ovary with simple style.

Fruit :- Each flower produces 4 nutlets covered with short hooked or barbed prickles when mature.

Seed :- A single plant produce about 8000 seeds, brown to grayish brown, rounded-triangular in shape, covered with short, hooked prickles.

Seed dispersal :- through animal, wind, flooding and irrigation.

Ecology :-

Habitat :-	Pastures, road sides, forests edges, and meadows, established in sites frequently disturbed, suppresses the native grasses, coarse, gravel, sand, sandy soils.
Season :-	Biennial also as perennial
Growth :-	Leaf rosette during first year, during second year produce erect plant, can reach 6 dm tall, branched above.
Flowering :-	June-August
Fruiting :-	September, October
Seed dispersal :-	Seed are major re-productive part. Seed can spread in 1-2 meter radius from mother plant, 90% viability, disseminated by animals and through crop seeds.
Introduction potential:-	Through import of food grains. Distribution of contaminated wheat. In PDS the screening may reach to the wheat fields and other areas through manures. Introduction Potential is Very High.
Adaptability:-	Establish well in temperate conditions and has higher adaptability to different environment as tropical and sub-tropical and various soil types. Establishment potential is rated as High.
Spread potential :-	Spread Potential High.
Potential environmental impact :-	This weed is poisonous, noxious, plant contains pyrrolizidine alkaloids that stop the reproduction of liver cells in cattle, horse and sheep. Animals die within 6 months after getting lethal amount of weed Environmental impact Medium.
Potential economic impact :-	The crop quality is reduced apart from the yields. Cost of weed control increased. Poisonous to live stock, it may cause cancer, liver damage, dermatitis and eye diseases.
Control :-	Specific control methods for this weed are not available. This weed should be hand weeded before formation of seeds. Chemically it can be controlled by application of 2,4-D Amine 0.5 kg/ha post-em, <i>chlorsulfuron</i> 40 g/ha, <i>picloram</i> at 0.56 to 1.12 kg/ha or <i>dicamba</i> 1.12 kg/ha. The bioherbicide <i>Erysiphe Cynoglossi</i> a powdery mildew fungus is a commonly occurring pathogen which can affect seed production Root Weevil (<i>Mogulones Cruciger</i>) and Flea-beetle (<i>Longitarsus Quadriguttatus</i>) feed on this weed.

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Solanum carolinense (HORSENETTLE)

***Solanum carolinense L.* (Horse nettle)**

Carolina horseradish, bull nettle, sand briar, devils tomato, ball night shade.

Regulated weed under schedule VIII of PQ.

Family :-

Solanceae

Distribution :-

Native to Gulf states, distributed in temperate and tropical zones of North America, South America, Oceania, Europe and part of Asia. In North America it occurs in Canada, Mexico and USA and in South America, it is found in Haiti and Brazil. In European countries it is found in Croatia and Norway. In Oceania countries it is reported in Australia and New Zealand. This weed is considered as noxious weed in 38 states of USA and Canada. USA is also considered its origin.

Biology:-

Habit :- Perennial, shrubby, erect plant.

Regeneration :- By seed, roots, root cuttings.

Root :- Tap root system, deep spreading rhizomes.

Stem :- 1 Meter tall, but shorter, armed with small spines and become woody with age. The stems possess stellate hairs, greenish to purple, angled at the nodes.

Leaves :- Simple alternate, leaf blade 20 cm X 7 cm, lance-ovate, often lobed, with spines on mid-rib veins and petiole.

Inflorescence :- Axillary racemes, some times branching, compact in flower, but quickly elongating in fruit to +/- 20 cm long.

Flowers :- Pedicillate, actinomorphic, complete, corolla white to lilac or purple, gamopetalous, 5-lobed, 3 cm broad, calyx-sepals deeply lobed five, calyx tube 3 mm long, gamosepalus, persistant, stamen 5-filament yellowish-green, 2 mm long, glabrous. Anthers-yellow, 7-8 mm long, stigma-dark green color, style-greenish glabrous, 1.5 cm long. Ovary superior, glandular pubescent, whitish 2 mm diameter, ovules many.

Fruit :- Yellowish, globose, 1.5 cm diameter, green when immature, turning orange-yellow and wrinkled with maturity. Single berry may contain 40-120 seeds.

Seed :- Flattened, roundish, with a beak yellowish to orange brown, 1.3 - 5 mm X 1.3 - 2.2 mm smooth.

Ecology:-

Habitat :- It grows in grain and vegetable fields, orchards, pastures and nurseries. Also found on road side, in waste land, river banks, gardens, in wide range of soil types. Thrive well in sandy or gravelly soil.

Season :- Plant grows rapidly during hot weather and tolerate drought.

Flowering :- March to October.

Fruiting :- March to October.

Seed dispersal :- Through irrigation water, flooding, soil, food grains, wind.

Introduction potential :- Very high introduction potential. Through import of the food grains / seed. In India it is introduced through imported wheat grain from Australia. Wheat is distributed all over 10 states through PDS. Hence, likelihood of its introduction potential in PRA area is increased. The screening of wheat reach to the garbage / manure pits and then to the fields and non cropped areas.

Establishment potential :- This species is the major weed of wheat, maize, potato, tomato, groundnut, soybean, tea and apple. It has higher reproductive potential, a single plant can produce 5000 seeds. Per season.

Germination rate :- Very High

Spread potential :- Spreads by seeds, roots and root cuttings the horizontal root that extends upto several meters from tap root may aid. Tillage operations, animals-cattle, horses, pigs, sheeps, disseminate this weed seed by grazing and passing through digestive system. Spread potential is rated Very High in PRA area.

Potential economic impact :-

It may become troublesome in the introduced area as it is very difficult to eradicate. Cause yield reduction in crops and deteriorate the quality of produce. This weed causes direct economic losses in Agricultural fields in Canada, USA, Australia and Japan. It also act as alternate host for several pests and diseases and hence also cause indirect losses. The potential economic impact is rated High.

Potential environmental impact :-

Solanum carolinense is poisonous weed except fruit. The tuberous root contain crystals of calcium oxalate and declared as noxious weed in 38 states of USA. Animal feeding results in digestive disorder, sleepiness and paralysis. It has effect on environment indirectly. The potential environmental impact is rated as Medium. The toxic glucoalkaloid causes anorexia, depression, excess salivation, diarrhoea, trembling, weakness and colic in human and live stock.

Control :-

The spesific control methods for this weed are not available. Plant should hand weeded as and when found in the area. The roots should be dug out, collected and burnt. An application of 2,4-D with one of the post emergent grass killer (i.e. ULTIM, ACCENT) provides better control. A sequential application of glyphosate at 1 kg/ha provides good control.

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***Viola arvensis* (EUROPEAN FIELD PANSY)**

***Viola arvensis* Murr. (Europion field pansy)**

Syn. Viola tricolor var. *arvensis* (Marr.) Boiss

Regulated weed in India under schedule VIII of PQ.

Family :- Violaceae

Distribution :- This weed is native to Europe and distributed to all over European Union. It also occurs in USA, Russia, Algeria, Morocco, Tunisia, Cyprus and Turkey. This weed is found in cereal crops and sugar beet fields in U.K and considered as agricultural weed. It is also found in lawns, gardens and waste lands. Recent import of wheat to India from Russia revealed contamination of wheat with this weed seeds. Wheat has been distributed to public in PDS.

Biology :-

Habit : Annual weed grows up to 35 cm, life span 125 days.

Regeration :- by seed.

Root :- Taproot system, much branched giving appearance of fibrous roots.

Stem :-

Prostrate to erect and branched.

Leaves :-

Simple, petiolate, petiole 1cm, leaf blade 15-30 mm × 3-10 mm, pinnately lobed. Leaves are glabrous except for along the veins on the under sides. Upper leave linear, ranging from 2 cm to 7.5 cm long and 1.5 cm wide. Stipules occur at the base of the leaf petioles of the flowering stem, stipules divided in 5-9 linear segments.

Inflorescence :-

Pedunculate, peduncle less than 80 mm, axillary, solitary.

Flower :-

Pedicellate, pentamerous, sepals 12 mm, appendages 4 mm, petals ear-shaped, whitish yellow.

Fruit :-

Glabrous, 5-9 mm, capsule, round, small seeds.

Seed :-

75 seeds/capsule.

Ecology

Habitat :- Found in lawns, gardens and wastelands.

Season :- Winter annual

Growth :- Germination-March to December.

Flowering :- April to October

Fruiting :- April to November

Seed dispersal :-	by irrigation, flood, wind, animals and agricultural operation.
Introduction potential :-	is very high. Imported wheat distributed in PDS resulted its introduction.
Establishment potential :-	This weed can establish very well in wheat, maize, soybean etc. The crops can be host for this weed. This weed is widely distributed in humid temperate regions, it has better adaptability against varied climatic conditions.
Spread potential :-	The weed produces many small seeds which are disseminated by various means and infest the crop fields.
Potential environmental impact :-	This weed may affect the native plant species on introduction in the various ecosystems
Potential economic impact :-	The weed may reduce the crop yield and may become a potential threat to native plant biodiversity.
Control :-	Cultivation of competitive cover crops will reduce the growth of this weed and reduce the seed production. Use of clean seed. Repeated tillage operation. In fallow land glyphosate 0.5 kg/ha as foliar spray or fluroxypyr + 2,4-D as foliar spray control this weed effectively.
Invasive Alien Weed species already introduced to India	
The major Invasive Alien weed species which have been introduced from their native habitat to a new location in India comprised of <i>Ageratum houstonianum</i> , <i>Argemone mexicana</i> , <i>Avena fatua</i> , <i>Eichornia crassipes</i> , <i>Ipomoea carnea</i> , <i>Lantana camara</i> , <i>Mikania micrantha</i> , <i>Mimosa rubicaulis</i> , <i>Parthenium hysterophorus</i> , <i>Phalaris minor</i> , <i>Prosopis juliflora</i> and <i>Salvinia molesta</i> . These invasive alien weed species caused severe losses to our agriculture forests, grazing land and water bodies. If the appropriate measures are not adapted to control / eradicate these weeds, they will alter the whole ecosystem and the native biodiversity will be affected.	

NATIONAL INVASIVE WEED SURVEILLANCE PROGRAMME

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