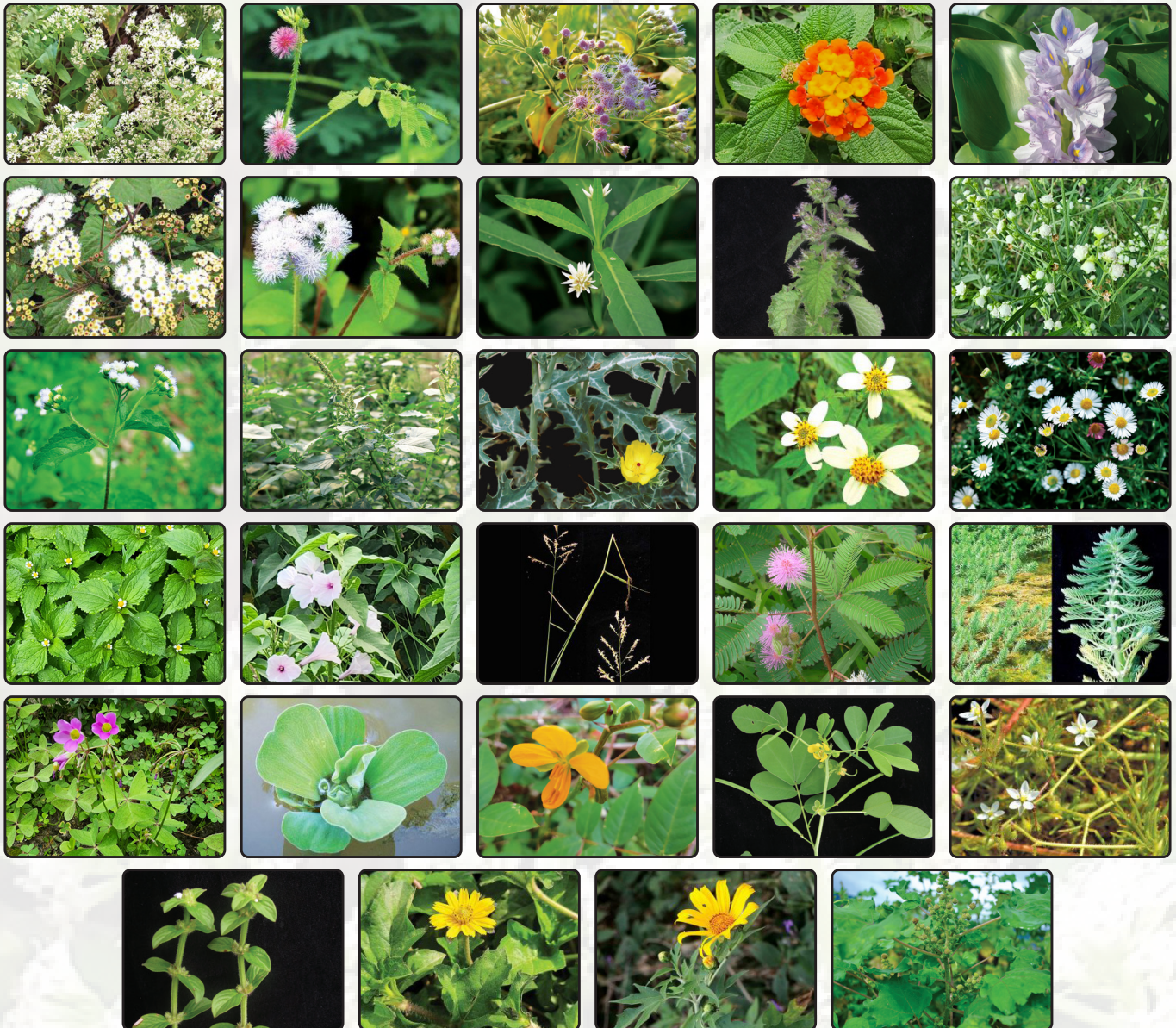


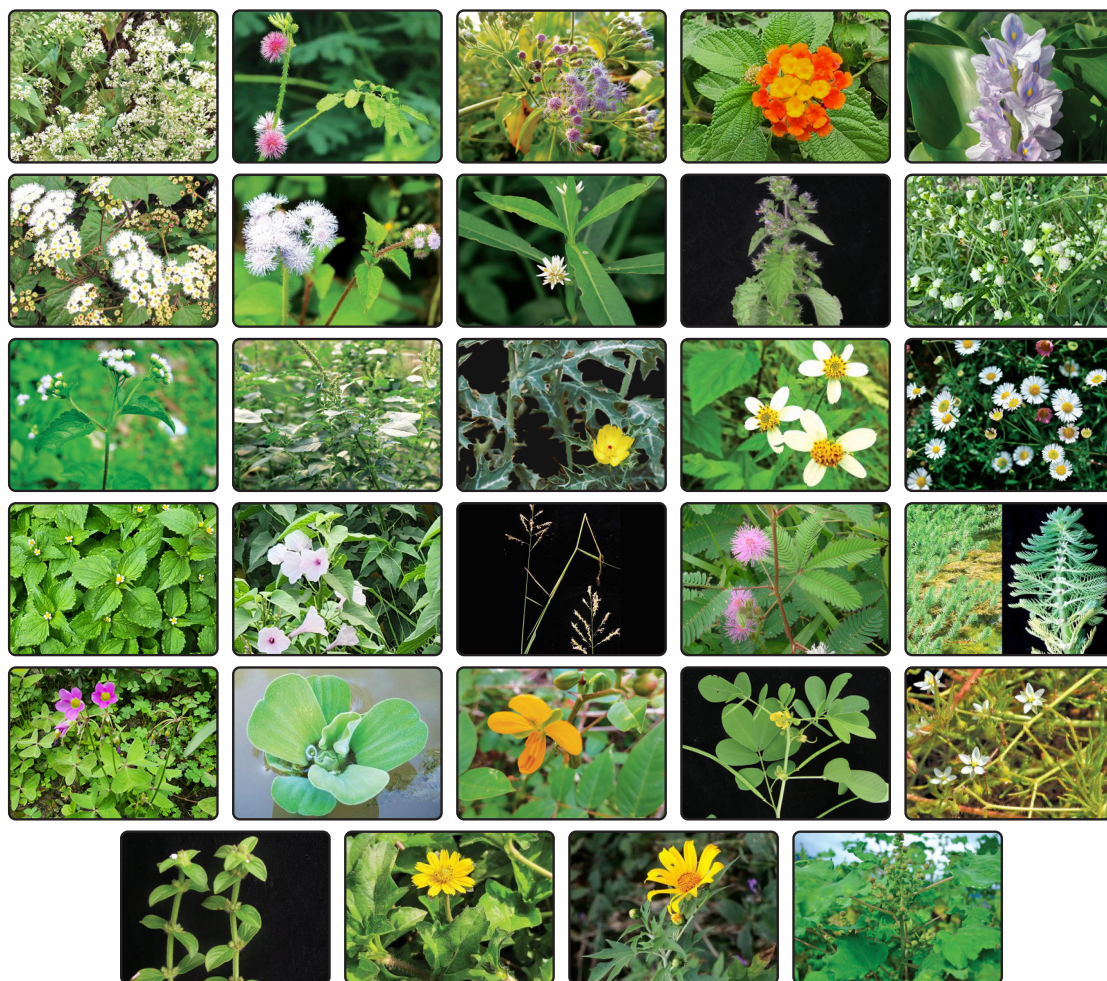
FIELD GUIDE TO INVASIVE ALIEN PLANT SPECIES OF NEPAL



Government of Nepal
Ministry of Forests and Environment
Forest Research and Training Centre
Kathmandu, Nepal



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Back cover page: *Mikania micrantha* spreading extensively over the transmission lines along the Mahendra Lok Marga (PC: Sunita Ulak)

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Foreword

It is a great privilege for the Forest Research and Training Centre (FRTC) to present this Field Guidebook of Invasive Alien Plant Species in Nepal, a comprehensive guide developed to support researchers, forest managers, students, community practitioners and all stakeholders dedicated to understanding and addressing one of the most pressing ecological challenges.



The FRTC, as the institution for forestry research, survey and knowledge dissemination, is dedicated in generating evidence-based policy formulation and required interventions. This guidebook seems important towards strengthening Nepal's capacity to rightly identify, monitor, and effectively manage the invasive alien plant species. It brings together diagnostic characteristics, distribution information, management option and high-quality botanical sketches to aid accurate identification in the field. A unique and commendable feature of this guidebook is its emphasis on botanical illustration sketches. These detailed illustrations provide a clear, accurate, and easily understandable means of identifying these species in their natural habitats.

I extend my sincere appreciation to the dedicated compilation team including **Sunita Ulak**, Senior Research Office; **Madhav Neupane**, Scientific officer; **Pratik Pandeya**, Research Officers and **Dr. Seerjana Maharjan**, Training officer at FRTC for their hard work and key contributions in preparing this field guidebook. I further express my gratefulness to **Prof. Dr. Bharat Babu Shrestha** (Tribhuvan University), one of the most prominent scientists in this topic in Nepal and abroad, for his valuable and insightful review, which greatly improved the quality of this publication. The detailed botanical illustrations prepared by **Neera Joshi Pradhan** have added exceptional value, enhancing the usefulness of the guide for field application. Moreover, my appreciation goes to all Deputy Director Generals **Rabindra Maharjan**, **Rajendra Basukala** and **Dr. Rajesh Malla** for their exceptional coordination, and publication committee of the FRTC for their thorough review and recommendation.

This publication stands as an important contribution to Nepal's ongoing efforts to understand, monitor, and manage invasive alien plant species. I am confident that it will support, promote timely interventions to prevent entry and spread of the invasive species, and contribute to the conservation of Nepal's diverse and irreplaceable biodiversity and vulnerable ecosystems.

.....
Rajendra K.C.
Director General

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Background

Nepal is globally renowned for its remarkable geographical, climatic, and biological diversity. Despite its relatively small area, the country encompasses a wide range of ecosystems, from tropical lowlands to alpine meadows, supporting an exceptional variety of plant and animal species and ecosystems. However, various direct and indirect human activities have been threatening this unique biodiversity, and biological invasion has recently emerged as one of the serious threats to native species, ecosystems and people's livelihood. Research has established that the spread of invasive alien species is the second leading drivers of biodiversity loss globally. Nepal is highly vulnerable to biological invasions due to its diverse topography, climatic variation, increasing trade, transportation, and tourism. In addition, open borders with neighboring countries and weak quarantine and monitoring mechanism have further facilitated both accidental and intentional introduction and spread of invasive alien plants. Nepal is considered as one of the country most at risk from biological invasions. In fact, according to a 2016 study of 124 countries, Nepal was ranked third in terms of relative threat to its agricultural sector from invasive species (Paini *et al.*, 2016).

In Nepal, new records of invasive alien species are being reported every year and these species can outcompete native vegetation, alter ecosystem structure and function, reduce biodiversity, degrade habitats, and negatively impact nature's contributions to people and human well beings. The spread of invasive alien species has been increasingly observed from the Tarai and Chure regions to the mid-hills of Nepal. Consequently, forest areas, agricultural lands, wetlands, and pastures are being degraded, negatively affecting the livelihoods of communities that depend on

these natural resources. The impacts of invasive alien plant species are multidimensional. They displace native plants, reduce nutrient availability and increase management costs for forest and agricultural systems. Therefore, addressing the invasive alien species problem requires not only coordinated institutional efforts but also active involvement of individuals, communities, and stakeholders across all sectors. Every citizen has a role to play in preventing new introductions, detecting early invasions, and managing existing infestations to protect Nepal's unique ecosystems and native species.

In this context, the Forest Research and Training Centre (FRTC) has developed the Field Guide Book on Invasive Plant Species of Nepal to support awareness, identification, and management of invasive plants. This field guide provides scientifically verified information along with clear sketches of invasive species to help users easily recognize them in the field. The illustrations and concise descriptions are intended to make the guide practical for forest and agriculture technicians, researchers, students, framers and local communities alike.

The publication of this book aims to enhance understanding of the invasive alien species problem, facilitate early detection, and encourage community participation in controlling invasive species. By making accurate identification accessible to all, this guide seeks to strengthen national capacity for biodiversity conservation and sustainable ecosystem management. Ultimately, it serves as an important step toward safeguarding Nepal's rich natural heritage and improves people's livelihood from the growing threat of invasive alien plant species.



कालो बनमारा

Ageratina adenophora ×1
(KATH 089272)

Ageratina adenophora (Spreng.) R.M.King & H.Rob

Common Name: Crofton Weed, Sticky Snakeroot, Mexican Devil

Local Name: Kalo Banmara, Banmasa

Family: Asteraceae

Habit and Habitat: Shrubs growing in open areas, degraded forests, forest edges, stream banks, roadsides, abandoned farm lands, and disturbed sites.

Diagnostic features

Stem: Purplish brown, glandular pubescent.

Leaves: Simple, opposite, ovate, apex acute, serrate, petiolate.

Flower: Flowers small, white in dense terminal clusters.

Fruit/Seed: Achenes small, black-brown, and 5-angled.

Root: Tap root system.

Phenology

Flowering: October to April

Fruiting: February to April

Distribution

Native range: Mexico

Distribution in Nepal: Tarai, Siwalik, Middle Mountains and High Mountain region from east to west

Elevation range in Nepal: ≤200 to 3200 m

Introduction pathway

Accidental.

Impacts

Ageratina adenophora spreads rapidly, forming thick stands into forests, pastures, river banks and roadsides, and competes strongly with native plants hence reduce or replace the native species and also reduces forage production in range lands. It's allelopathic property changes soil conditions and affects small soil organisms, disrupting natural forest functions such as nutrient cycling and wildlife habitats.

Management options

Ageratina adenophora should be removed at an early stage to prevent the formation of dense stands. It can be controlled by uprooting the plants before flowering to prevent seed spread, followed by planting fast-growing native species to reduce re-invasion. Regular monitoring is important to prevent the invasion into new regions. In addition, involving local communities in awareness and control programs is vital to ensure sustainable, long-term management.

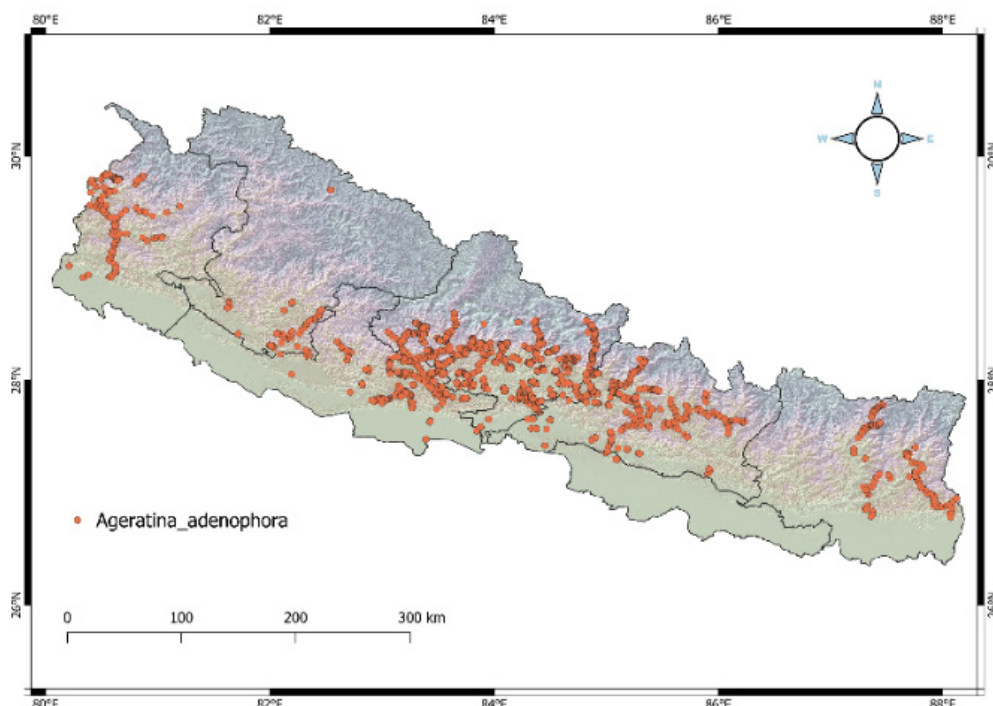


Figure 1: Distribution of *Ageratina adenophora* (Spreng.) R.M.King & H.Rob in Nepal.



ગાંધે

- a. *Ageratum conyzoides* ×1
b. Flower Head ×2

Ageratum conyzoides L.

Common Name: Billygoat Weed, White Weed

Local Name: Seto Gandhe, Ganamane

Family: Asteraceae

Habit and Habitat: Herbaceous weed distributed in plantation, agricultural land and along roadsides.

Diagnostic features

Stem: Thick and robust, covered with white soft hairs, simple or branched from the middle, branches reddish or green toward the apex.

Leaves: Leaves have acute base, covered with dense soft white hairs with small yellow dots; oval or long-oval with 3 main veins at base (sometimes 5 veins), pointed at tip.

Flower: Small 4-14 white flower heads together with small 0.5 to 1.5 cm long stalk, form dense clusters at the end of branches; flower cup is bell-shaped or hemispherical without hair; two rows of small leaf-like parts around the flower (phyllaires).

Fruit/Seed: Fruits are achenes. Seeds black, 5-sided with a few tiny white bristles which help in dispersal.

Root: Tap root system

Phenology

Flowering: All year round but more common during rainy season

Fruiting: All year round but more common during rainy season

Distribution

Native range: Central & South America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 75 to 2100 m

Introduction pathway

Through the contaminants of agricultural products.

Impacts

It is an agriculture weed and therefore, outcompetes crops, reduces agriculture production, and increases weeding cost. It inhibits the germination and growth of native plant species due to its allelopathic nature has a negative effect on root development and reduces production.

Management options

Physically by uprooting, burning, or cutting; using conservation tillage systems; flooding the field, and hand-weeding; use of the herbicides like glyphosate, glufosinate in farm lands but not in natural ecosystems.

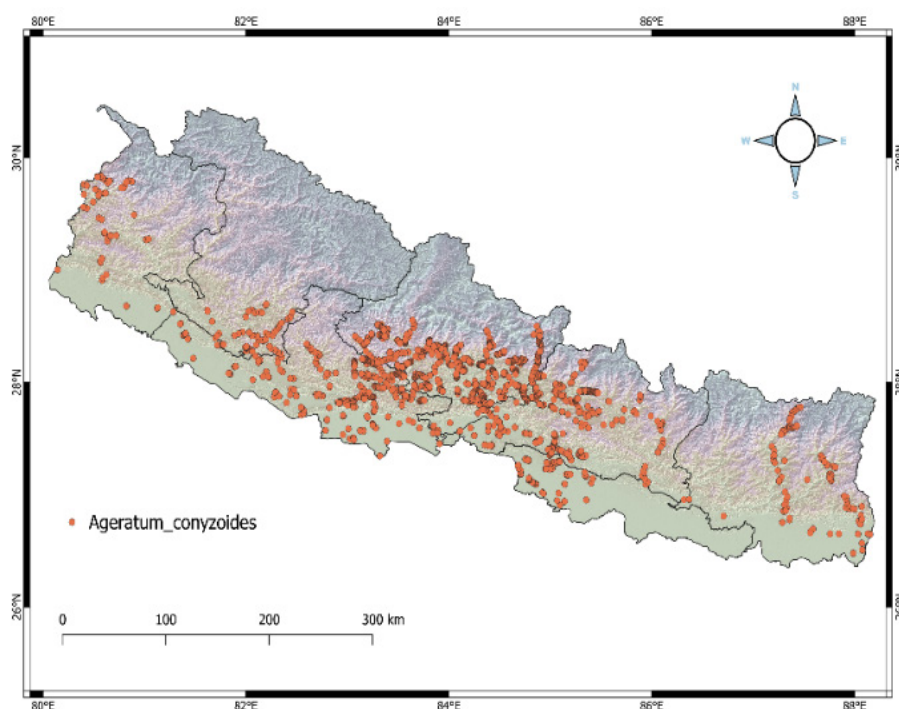
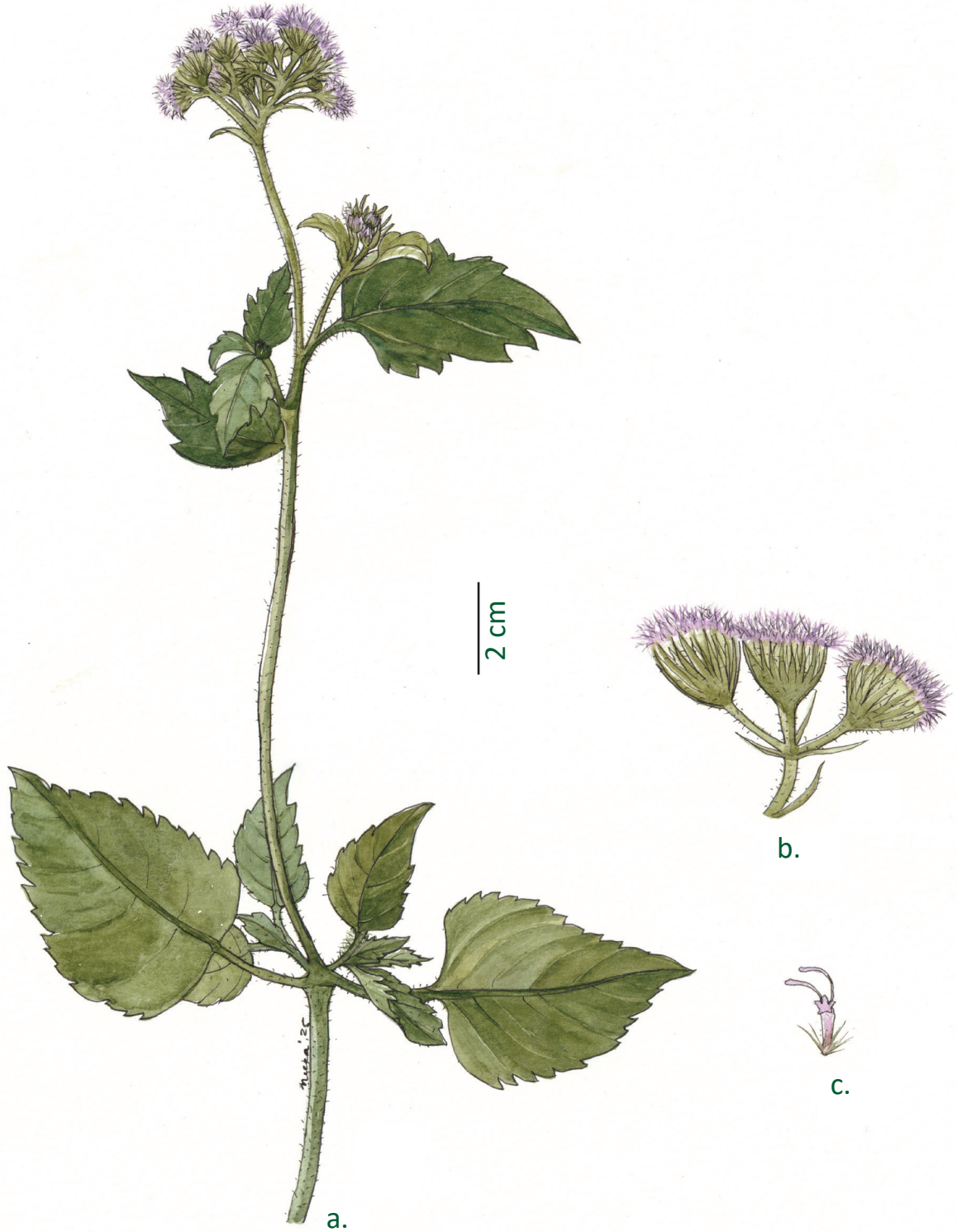


Figure 2: Distribution of *Ageratum conyzoides* L. in Nepal.



नीलो गन्धे

- a. *Ageratum houstonianum* ×1
- b. Flower heads ×2
- c. Floret

Ageratum houstonianum Mill.

Common Name: Floss Flower, Blue Mink, Blue Billy-goat Weed.

Local Name: Nilo Gandhe

Family: Asteraceae

Habit and Habitat: Herbaceous weed distributed in crop lands, fallow fields, grasslands, forest margins, tree plantations, roadside edges and urban gardens.

Diagnostic features

Stem: Stem cylindrical, 30-70 cm tall, simple or branched from middle/lower parts, sometimes decumbent and rooting at nodes; densely covered with soft white hairs and occasional glandular hairs on upper parts; green, purplish, or reddish.

Leaves: Opposite, broadly ovate or triangular, base heart-shaped or flat, margins toothed, upper and lower surfaces hairy, dull green, crushed leaves slightly pungent.

Flower: Small, funnel-shaped, bluish-purple (sometimes white), in clusters of 5-60 heads; Involucre of bracts hairy.

Fruit/Seed: The plant produces small black seeds, each with tiny scales (pappus) that help them spread by wind. The seeds may have short hairs, and can grow easily on open soil, which makes the plant spread quickly.

Root: Tap root system.

Phenology

Flowering: March to August (occasionally year-round in warm lowlands)

Fruiting: March to August (occasionally year-round in warm lowlands)

Distribution

Native range: Mexico to Central America

Distribution in Nepal: East to west in the Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: ≤200 to 2150 m

Introduction pathway

It was introduced as an ornamental plant and as a contaminant of agricultural products and escaped from gardens to roadsides, open lands, agricultural land and forest edges.

Impacts

Ageratum houstonianum is an invasive plant that spreads rapidly, outcompeting native vegetation and reducing biodiversity in forests, grasslands, and agricultural areas. It is one of the most troublesome invasive weeds in farmlands of Nepal. It can also affect crops through allelopathy, inhibiting germination and growth of plants like wheat, maize, and mustard, which lowers yields. Additionally, the plant poses a risk to livestock, as consumption can cause liver damage and other health problems.

Management options

Management of *Ageratum houstonianum* relies on an integrated approach. Hand weeding, mechanical uprooting, and mowing reduce plant density and seed spread. Cultural methods like tillage, mulching, and preparing the soil to remove early-germinating weeds suppress new weed growth. No reliable biological control exists, so regular monitoring and follow-up are essential for long-term control.

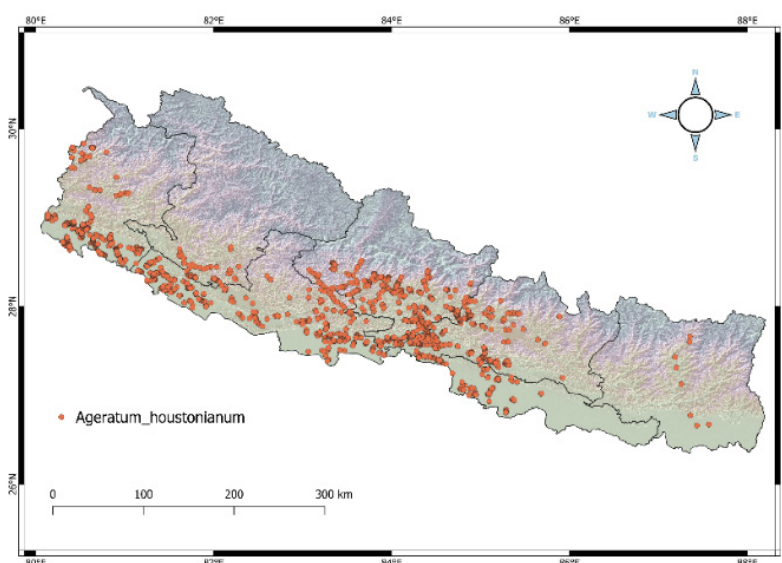


Figure 3: Distribution of *Ageratum houstonianum* Mill. in Nepal.



जल जिम्बु

- a. *Alternanthera philoxeroides* ×1
- b. Leaf (ventral side)
- c. Inflorescence ×2

Alternanthera philoxeroides (Mart.) Griseb.

Common Name: Alligator Weed

Local Name: Jaljambu, Patpate

Family: Amaranthaceae

Habit and Habitat: Perennial herb growing in shallow water pools, ditches and marshes, slow-moving water course, farm lands, wetlands and paddy field.

Diagnostic features

Stem: Stem hollow when mature, lying along the ground or spreading; smooth, hairless, reddish to light green, sometimes brownish-red on land; nodes swollen, producing adventitious roots and new stems; can grow up to 10 m long, forming mats up to 1 m thick.

Leaves: Leaves grow in pairs, broad and triangular-oval, tip pointed or rounded, base flat or slightly heart-shaped; dull green, a few hairs mainly on veins underneath; crushed leaves have a mild sharp smell.

Flower: Flowers small, clustered, and usually white or pale-colored; arranged in compact heads; each flower has tiny tubular petals; blooms throughout the growing season.

Fruit/Seed: Seeds small, oval to slightly angled, dark brown to black; dispersed by wind, water, or by sticking to animals.

Root: Roots fibrous, adventitious, spreading, and often arising from stem nodes.

Phenology

Flowering: June to September

Fruiting: June to September

Distribution

Native range: Central America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: up to 1500 m

Introduction pathway

Introduced through contaminated soil, water, or plant materials; can also spread by human activities, livestock, and transportation of garden or agricultural plants.

Impacts

Forms dense mats that smother native vegetation, reducing biodiversity and altering natural habitats. It competes strongly with native plants for light, nutrients, and space, often leading to the decline of local species. In agricultural lands and pastures, it reduces productivity by overtaking crops and forage plants. In aquatic systems, it blocks sunlight and lowers oxygen levels, disrupting ecosystems. Its rapid growth and stem nodes make restoration of invaded areas challenging.

Management options

Systematic monitoring is essential to detect early infestations and assess the effectiveness of control strategies over time, especially along water channels, wetlands, and agricultural fields. Regular, carefully planned herbicide application using biactive glyphosate and metsulfuron-methyl is widely practiced, typically implemented as spot-treatments, minimizing environmental impact. Mechanical strategies include manual removal of floating weed masses and lowering water levels to restrict regrowth.

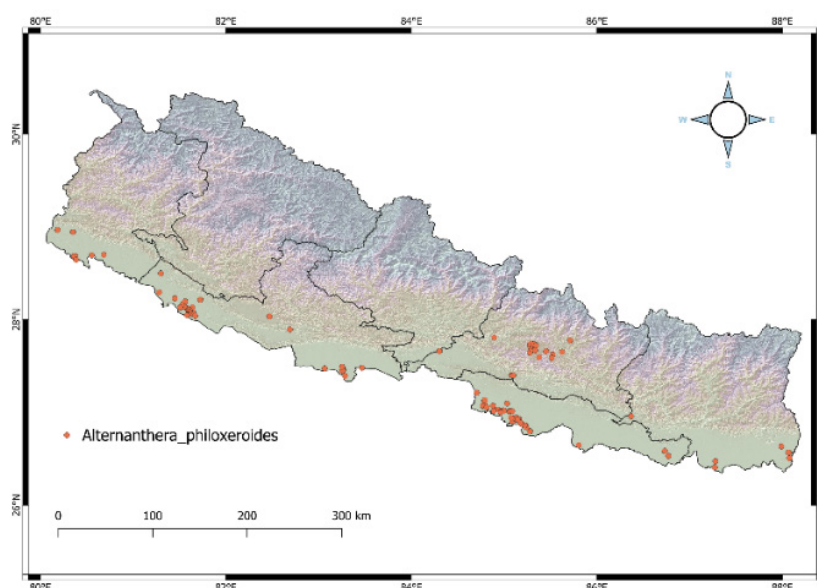
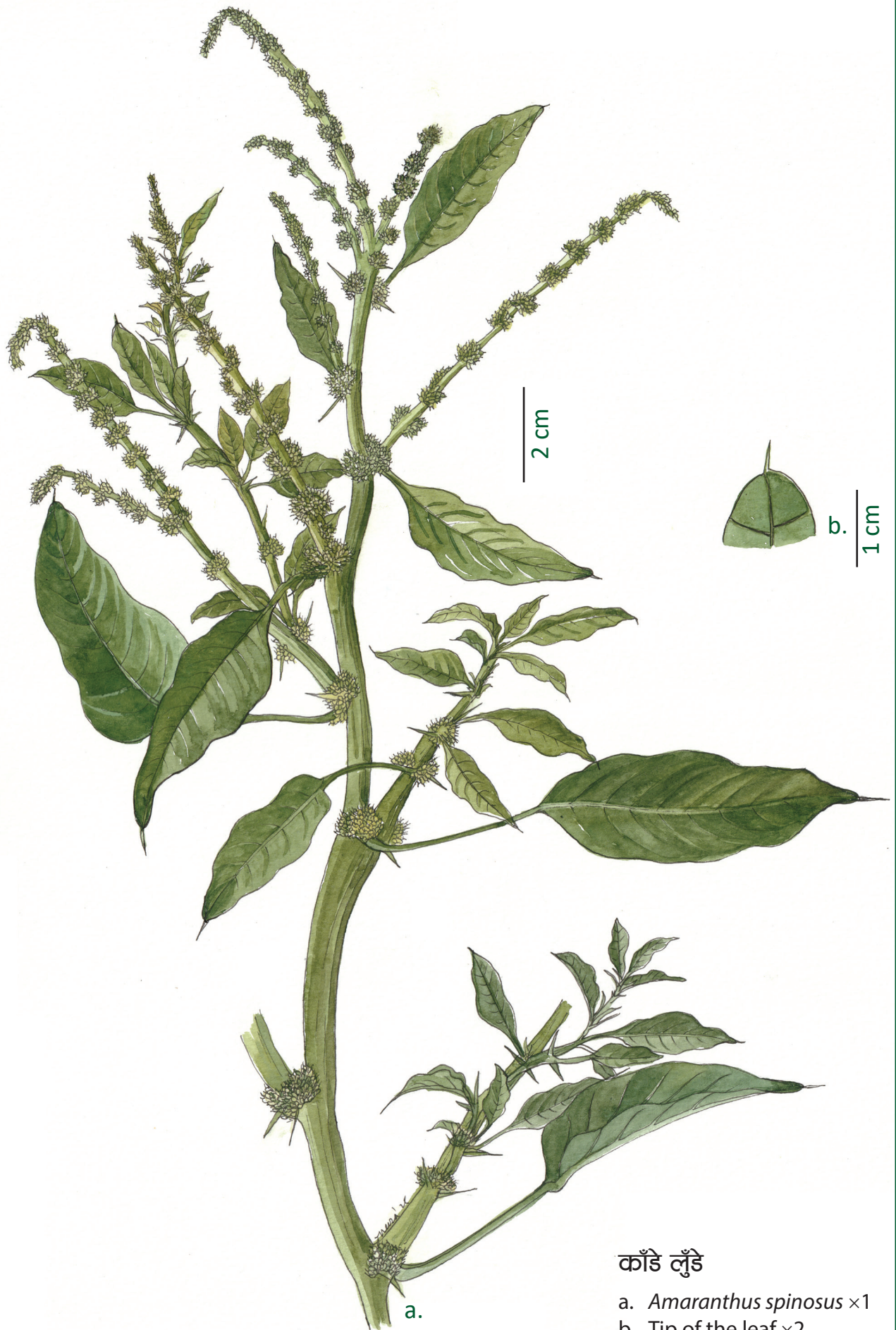


Figure 4: Distribution of *Alternanthera philoxeroides* (Mart.) Griseb. in Nepal.



काँडे लुँडे

a. *Amaranthus spinosus* ×1

b. Tip of the leaf ×2

Amaranthus spinosus L.

Common Name: Spiny Pig-weed

Local Name: Kande Lunde, Lunde Kanda, Ban Lunde

Family: Amaranthaceae

Habit and Habitat: Annual herb found in agricultural fields, roadsides, waste grounds, residential area and pastures.

Diagnostic features

Stem: Upright, green and smooth. Sometimes with very light hairs. Highly branched. Each nodes with paired spines.

Leaves: Leaf blade ovate-rhombic or ovate-lanceolate. Usually smooth sometimes with few hairs along the veins. Leaf base wedge-shaped.

Flower: Plant produce long flowering structure called spike. Spike is about 8-25 cm long. Male flowers are towards the apex. Each flower contains spiny bracts. Tepals are green with transparent edges and green or purple stripe towards the center.

Fruit/Seed: Fruits are Utricles which are inside the perianth. Seeds 0.5-1mm, black and shiny.

Root: Taproot penetrated deep inside soil with secondary roots arising from it.

Phenology

Flowering: All year round

Fruiting: All year round

Distribution

Native range: Tropical America

Distribution in Nepal: Tarai, Siwalik, and Middle Mountain region

Elevation range in Nepal: 60 to 2600 m

Introduction pathway

Contaminant.

Impacts

Displaces native plants and alters animal habitat. Due to its spiny nature it cause problems in pasture lands and croplands.

Management Options

Physical uprooting before fruiting and use of herbicides.

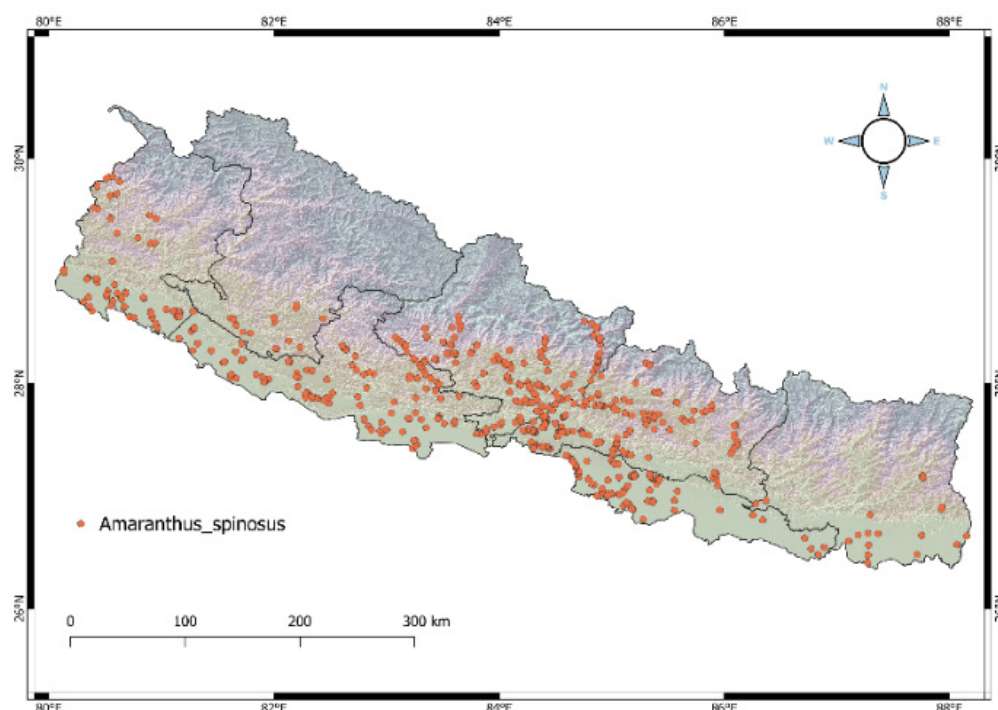
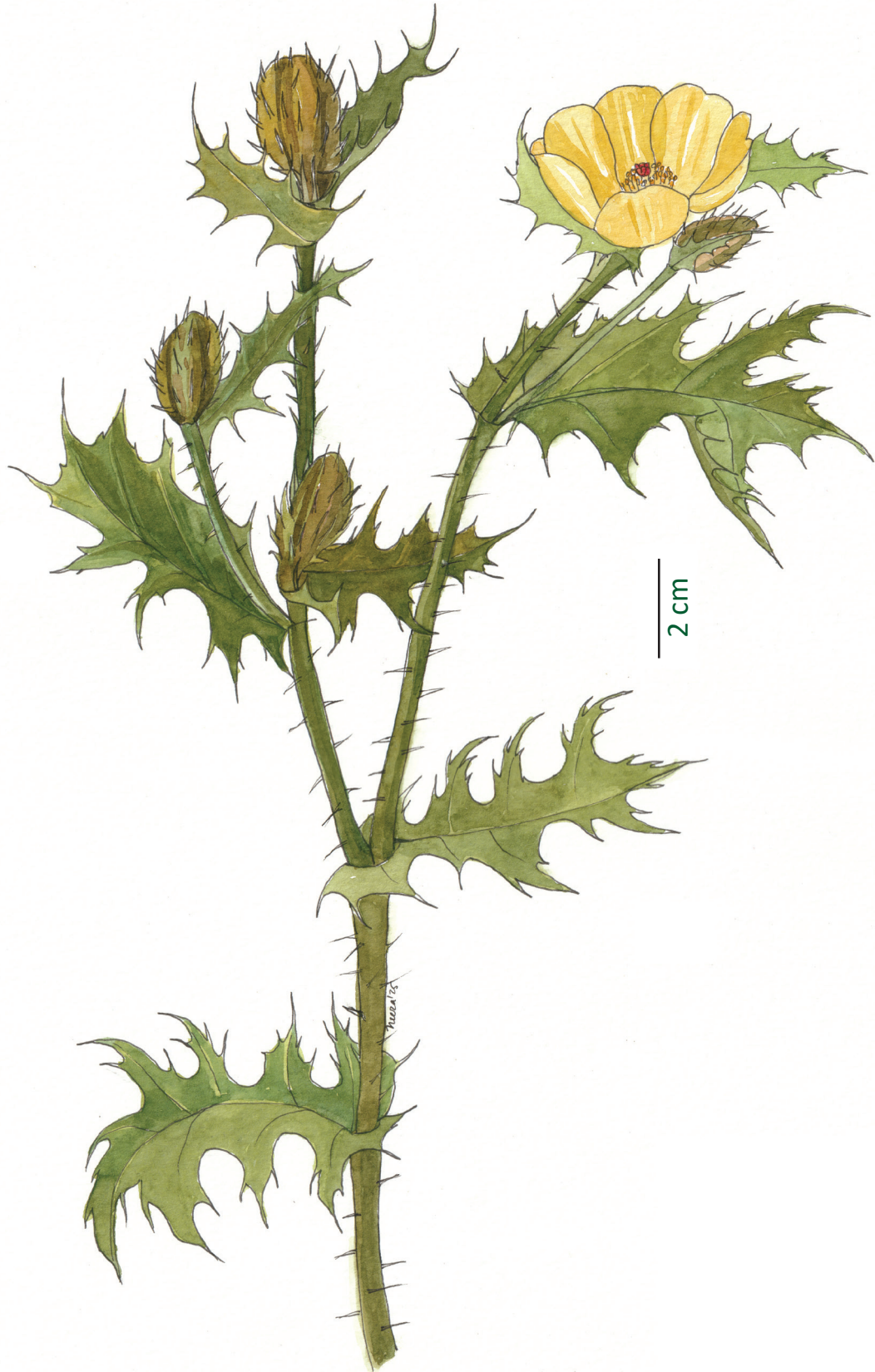


Figure 5: Distribution map of *Amaranthus spinosus* L. in Nepal.



थाकल

Argemone mexicana ×1
(KATH 034179)

Argemone mexicana L.

Common Name: Mexican Prickly Poppy

Local Name: Thakal, Sungure Kanda

Family: Papaveraceae

Habit and Habitat: Prickly annual herb found mostly in agricultural and fallow lands.

Diagnostic features

Stem: Stem are short and branched with few flat, yellowish brown spines, whitish green with yellow sap when cut.

Leaves: Basal leaves dense, blade smooth with bluish green markings on veins. Upper leaves alternate.

Flower: Flower solitary, with very short stalk, yellow, Sepals are boat shaped with spur at the tip, petals are yellow with round tip.

Fruit/Seed: Fruit is capsule, 2-4 cm long, seeds are round brownish black *ca.* 1 mm in diameter.

Root: Slightly branched tap root.

Phenology

Flowering: December to June

Fruiting: January to July

Distribution

Native range: Tropical Central and South America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 65 to 1400 m

Introduction pathway

Through contaminants of soil and agriculture products.

Impacts

It competes with crops for nutrients, and increases weeding cost in farmlands. It harm native flora through allelopathy, rapid growth, and spread. Cooking oil contaminated with its seed can cause fatal disease. The plant is also toxic to animals and humans. Animals usually avoid the plant but poisoning may occur through contaminated fodder. In overgrazed pastures, Mexican poppy can quickly spread and displace forage species.

Management options

Physical removal by hands can be challenging due to its prickly nature but agriculture utensils can be used to uproot and remove this weed before flowering. Use of herbicide is effective for controlling this weed in agriculture lands but this is not recommended in natural ecosystem.

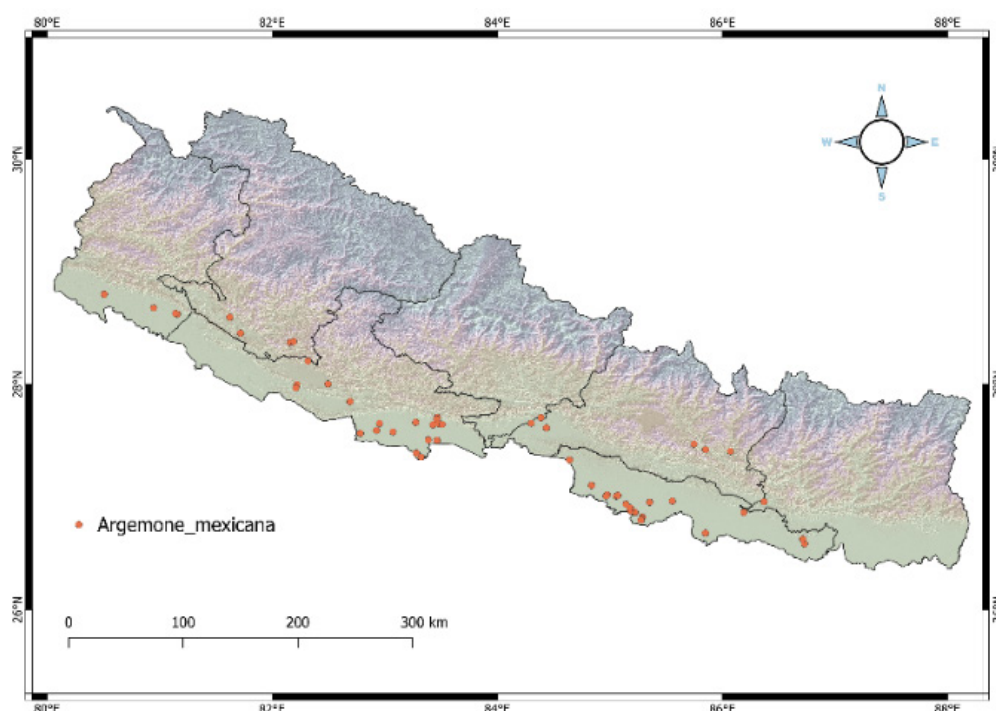
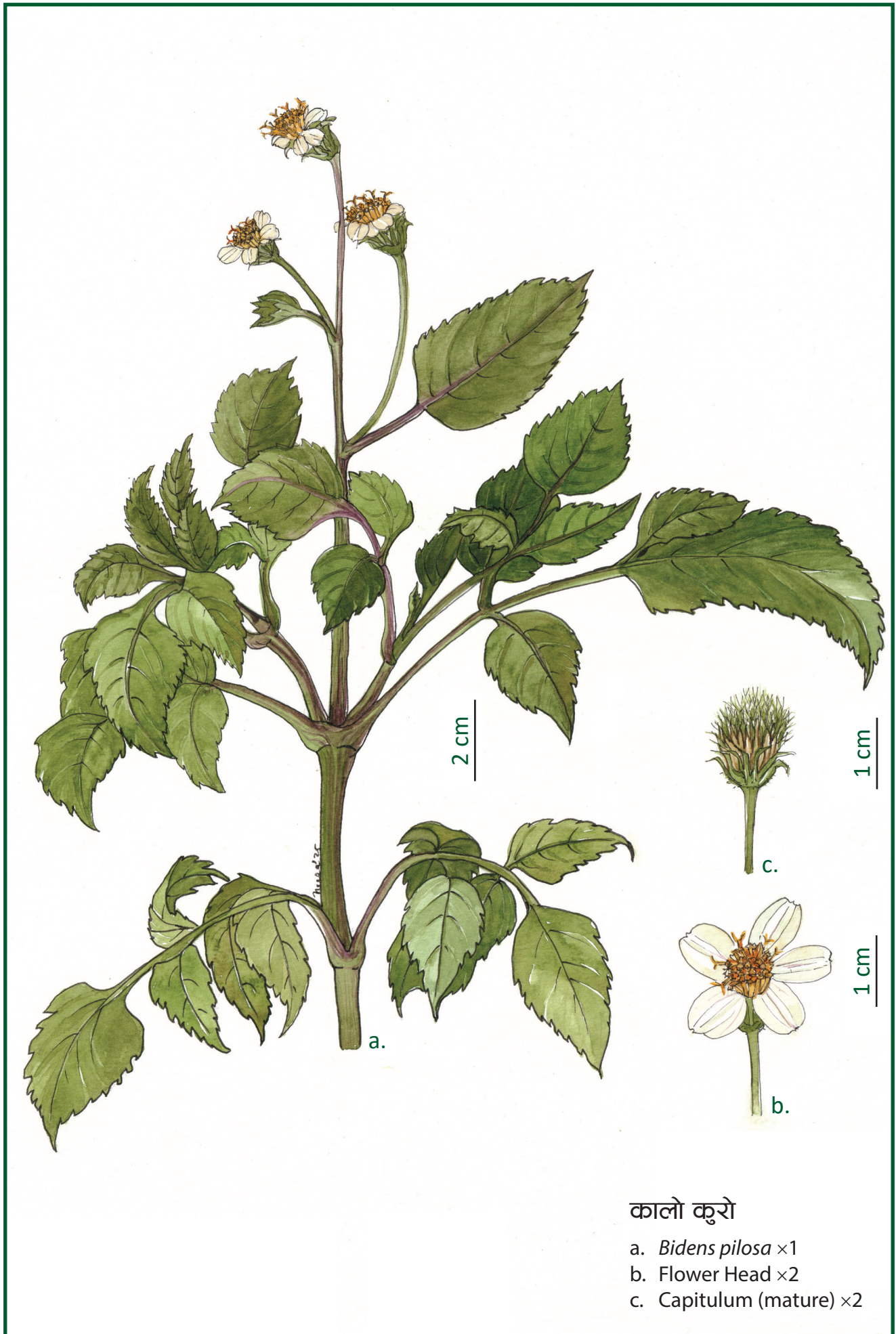


Figure 6: Distribution map of *Argemone mexicana* L. in Nepal.



Bidens pilosa L.

Common Name: Beggar's Ticks, Black Jack

Local Name: Kuro, Kalo Kuro

Family: Asteraceae

Habit and Habitat: Annual Herb found in agricultural land, open disturbed areas, abandoned areas and open forest.

Diagnostic features

Stem: Stem glabrous or soft-hairy, quadrangular.

Leaves: Opposite, simple or lobed or dissected, leaflets with serrated margins.

Flower: Flower heads appear singly or in loose clusters. Ray florets whitish-pink. Disc floret yellow.

Fruit/Seed: Fruits achenes, black, 4-16 mm long with 2-4 bristle like appendages, covered with short hairs which stick to human clothing and animal fur.

Root: Tap root system.

Phenology

Flowering: All year round.

Fruiting: All year round.

Distribution

Native range: Tropical America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 100 to 3600 m

Introduction pathway

Dispersed as contaminant of agriculture produces and other commodities; hitch-hiked by humans and animals.

Impacts

In agriculture lands, it competes with crops for mineral nutrients and increase weeding cost. Production of numerous fruits with spiny bristles make access to agriculture and pasture lands challenging. Sometimes, pointed bristles of fruits also causes injuries to human skin.

Management options

Hand pulling or digging out is useful in small area. As it is difficult to control mechanically in large area use of herbicides like glyphosate, glufosinate can be effective in agriculture lands.

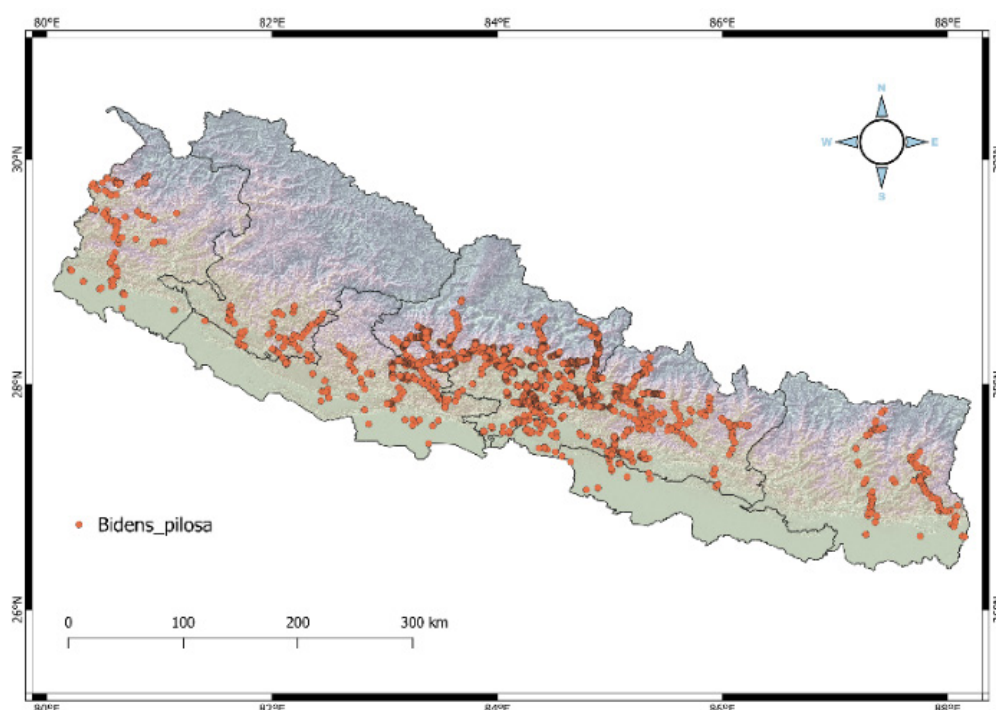


Figure 7: Distribution map of *Bidens pilosa* L. in Nepal.



सेतो बनमारा

- a. *Chromolaena odorata* ×1
- b. Group of capitula (Inflorescence) ×1
- c. Leaf (mature) ×1
- d. Leaf (young) ×1

Chromolaena odorata (L.) R.M.King & H.Rob

Common Name: Siam Weed

Local Name: Seto Banmara, Aule Banmara

Family: Asteraceae

Habit and Habitat: Perennial shrub growing along roadsides, forest edges, riverbanks, shrub land, grasslands, fallow lands, agriculture land and degraded forests.

Diagnostic features

Stem: Erect or scrambling, branched, often opposite green to purplish, slightly hairy, and woody at the base.

Leaves: Opposite, green on the upper side and pale underneath. They are oval to triangular, with a pointed tip. The surface feels rough and hairy, especially on the underside. The leaf edges may be toothed, uneven, or sometimes smooth, and the base is flat or slightly heart-shaped.

Flower: Small, tubular, and white to pale bluish, grouped in dense capitulum at the top of the stems. Each capitulum contains many tiny flowers, giving the plant a fluffy appearance.

Fruit/Seed: The fruits are small, dry, and brown to blackish, with five fine ridges along the sides.

Root: Tap root with profuse branching, forming a dense network that helps the plant to colonize in disturbed soils.

Phenology

Flowering: November to February

Fruiting: December to April

Distribution

Native range: Native to Central and tropical South America

Distribution in Nepal: Tarai Siwalik and Middle Mountain region

Elevation range in Nepal: 75 to 1500 m

Introduction pathway

It is believed that the initial introduction to Asia occurred through botanic garden in Kolkata. It was most probably introduced naturally through wind-dispersed seeds to Nepal via the eastern Tarai from West Bengal and Assam.

Impacts

Chromolaena odorata grows in thick, crowded bushes that block sunlight and stop native plants from growing. Its thick growth reduces crop yields, threatens the regeneration of trees, and negatively affects overall biodiversity by replacing native plants. The dense bushes make it difficult for people and animals to move, limiting access to farmland, forest resources, and grazing areas. It also increases hazards of wildfire.

Management options

Remove *Chromolaena odorata* before it flowers and produces seeds, preferably before the monsoon or flowering season, plant native trees and shrubs immediately after removal to prevent reinvasion, monitor soil and site conditions because invaded areas often have fewer native plants, and make control a regular part of forest management to ensure long-term ecosystem recovery.

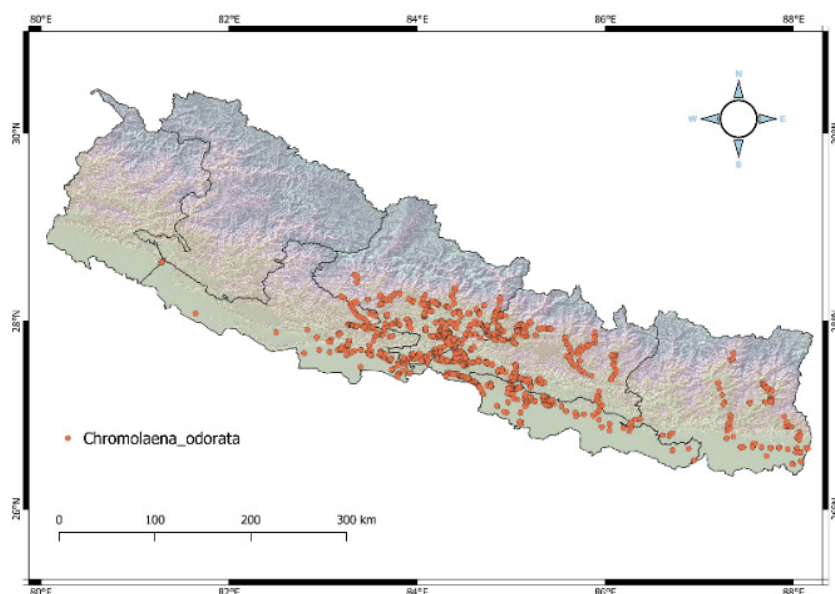


Figure 8: Distribution map of *Chromolaena odorata* (L.) R.M.King & H.Rob in Nepal.



फुले ऋार

Erigeron karvinskianus ×1
(KATH 066590)

Erigeron karvinskianus DC.

Common Name: Mexican Fleabane, Bony-tip Fleabane, Santa Barbara Daisy, Seaside Daisy

Local Name: Phule Jhar

Family: Asteraceae

Habit and Habitat: Herbaceous weed growing mostly on steep, along roadsides, often on cliffs or in rock crevices. It also grows in terraced agriculture lands.

Diagnostic features

Stem: Stem spreads out over a large area in irregular manner forming a dense mat, much branched. Stems have sparse stiff hairs

Leaves: Elliptical to ovate, margins smooth or sometimes with one or two pairs of lobes.

Flower: Flower head single or in clusters of few. Ray florets white to pinkish. Disc floret yellow

Fruit/Seed: Fruits achenes, 1.2-1.5 mm long, pale to reddish brown, small with pappus as bristles.

Root: Short rootstock with a tap root.

Phenology

Flowering: March to November

Fruiting: March to November

Distribution

Native range: Central & North America

Distribution in Nepal: Siwalik and Middle Mountain region

Elevation range in Nepal: 600 to 2100 m

Introduction pathway

Initially introduced as ornamental plant and subsequently escape to wild.

Impacts

It reduces forage production in agroecosystem and pasture.

Management options

Hand pulling before flowering and fruiting.

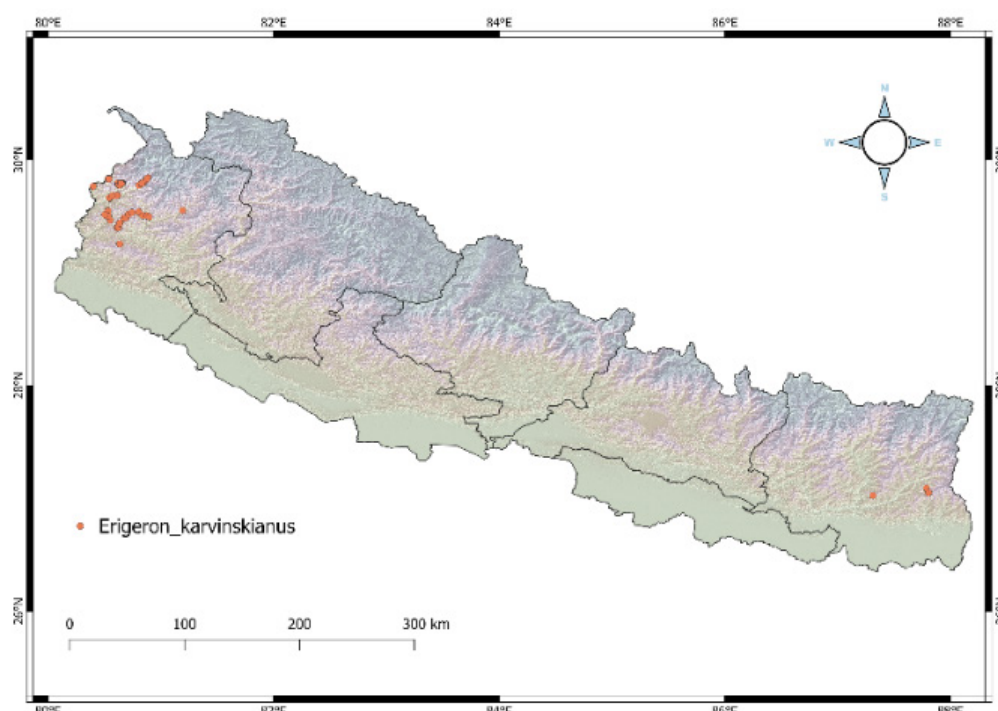


Figure 9: Distribution of *Erigeron karvinskianus* DC. in Nepal.



मृसे चित्ताङ्गे

- a. *Galinsoga quadriradiata* ×1
- b. Leaf ×2
- c. Flower head ×2

Galinsoga quadriradiata Ruiz & Pav.

Common name: Shaggy Soldier

Local name: Jhuse Chitlange

Family: Asteraceae

Habitat: Herb commonly growing in garden, agricultural field, roadside.

Diagnostic features

Stem: Green, hairy.

Leaves: Cauline, opposite, blade lanceolate to broadly ovate.

Flower: Flower head. Ray floret white. Disc floret yellow, Corolla 5-lobed.

Fruit/Seed: Fruits achenes *ca.* 2 mm long, Black.

Root: Tap root system with profuse branching.

Phenology

Flowering: May to October

Fruiting: June to October

Distribution

Native range: Mexico

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 450 to 2800 m

Introduction pathway

Through the contaminants of ornamental plants or crops.

Impacts

Reduces crop production by competing for nutrients and also increases weeding cost.

Management options

Hand pulling before flowering and fruiting.

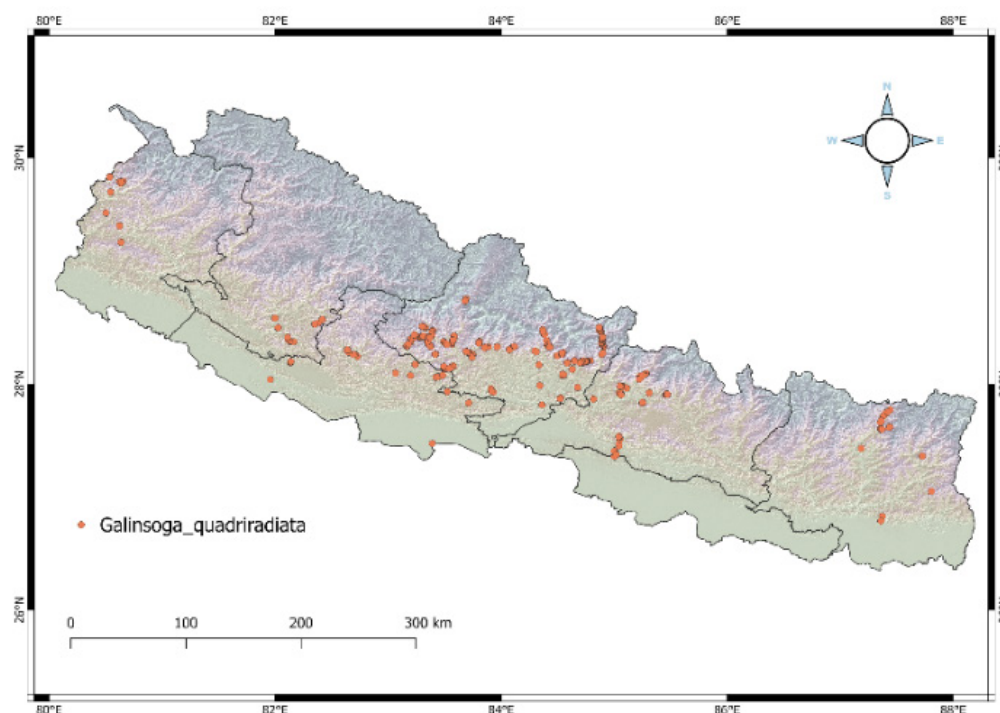


Figure 10: Distribution map of *Galinsoga quadriradiata* Ruiz & Pav. in Nepal.



बेशरम

a. *Ipomoea carnea* ×1

Ipomoea carnea Jacq.

Common Name: Bush Morning Glory

Local Name: Besharam, Ajammari

Family: Convolvulaceae

Habit and Habitat: Shrub growing in wetlands including river and spring sides, canals, ponds, lakes, irrigated farmlands.

Diagnostic features

Stem: Woody at the base, herbaceous at the tips; hollow, glabrous (smooth) or minutely puberulent (finely hairy).

Leaves: Roundish to oval or lance-shaped, 10–25 cm long; base flat or slightly heart-shaped; tip long and pointed; puberulent on both surfaces but sometimes glabrescent.

Flower: In small branching clusters near the ends of the stems, with one or several flowers in each cluster; outer sepals smaller than the inner ones, oval to nearly round; sericeous or smooth; sepal apex rounded/obtuse; inner sepal round or nearly round; corolla deep pink to rose-purple, tube infundibular (funnel shaped), limb campanulate (bell shaped), larger than 5 cm.

Fruit/Seed: Fruits capsular, ovoid to subglobose; seeds covered with long brown trichomes.

Root: Thick tap root and several lateral adventitious roots that make up its root system.

Phenology

Flowering: All year round (peak flowering happens during the warmer months)

Fruiting: All year round

Distribution

Native range: Tropical and subtropical regions of the Caribbean, Mexico, Central America and South America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 60 to 1350 m

Introduction pathway

Released for soil bio-engineering.

Impacts

Allelopathy; Habitat alteration by forming dense thickets; Impact on waterways; Toxicity to livestock.

Management options

Combination of approaches are required like mechanical removal, application of herbicide and restoration of native vegetation.

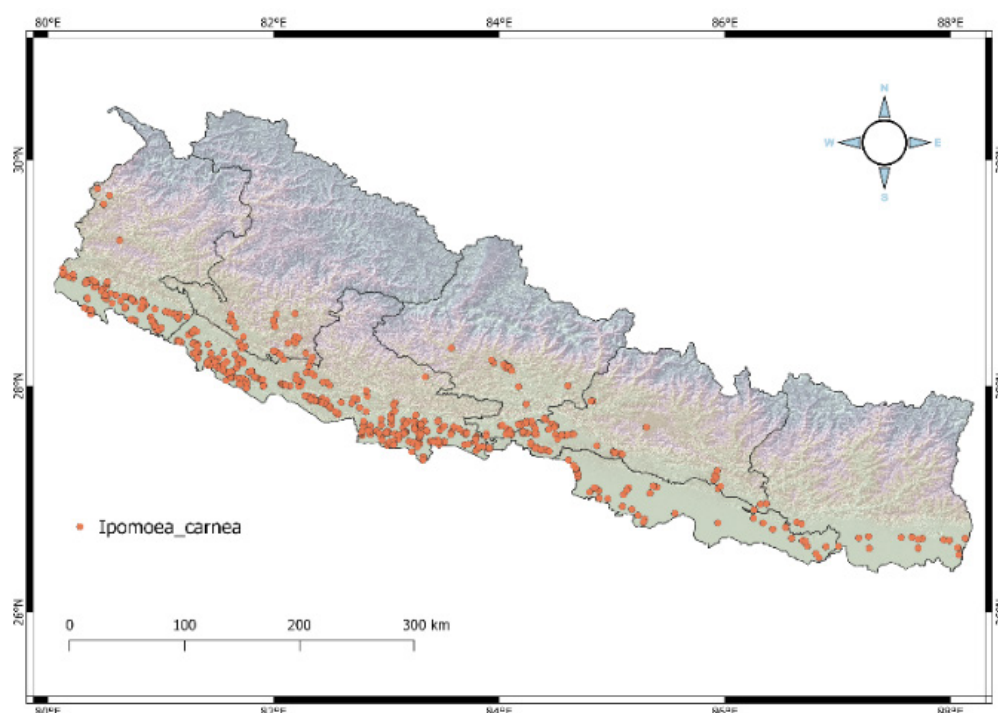


Figure 11: Distribution of *Ipomoea carnea* Jacq. in Nepal.



काँडे बनमारा

a. *Lantana camara* $\times 1$

b. Flower $\times 2$

d. Leaf $\times 1$

Lantana camara L.

Common Name: Lantana, Wild Sage, Red Sage

Local Name: Kande Banmara, Kirne Kanda

Family: Verbenaceae

Habit and Habitat: Woody shrub found in forest borders, disturbed forests, shrublands, grasslands, fallow lands, agriculture lands, road sides.

Diagnostic features

Stem: Woody, quadrangular, many-branched from the base, often with many small backward-curved thorns, covered with fine and glandular hairs and grey/brown color.

Leaves: Opposite; oval to slightly elongated. Upper surface rough, lower surface with sparse coarse hairs. Leaf tip is pointed or rounded; base can be unequal, rounded, flat, or heart-shaped. Leaf edges are toothed. Leaf stalks are short, hairy, sometimes slightly spiny, aromatic when crushed.

Flower: Grow in clusters from leaf axils. Flowers change color from yellow to orange, sometimes pink-purple, with a yellow throat. The flower tube is slightly curved and has tiny hairs outside. The flowers grow in dense clusters and are tube-shaped. Their colors change as they get older.

Fruit/Seed: Fruit is a small oval drupe, changing color from green to dark/black when ripe.

Root: Tap root with profuse branching. Strong and can regrow if cut.

Phenology

Flowering: Flowering likely occurs year-round, but more heavily during the monsoon period.

Fruiting: Fruiting begin soon after flowering and can be seen round the year.

Distribution

Native range: Central and South America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region from east to west

Elevation range in Nepal: up to 1700 m

Introduction pathway

Lantana camara was introduced to Nepal mainly as an ornamental plant for gardens, hedges, and landscaping due to its colorful flowers.

Impacts

Lantana camara is a highly invasive shrub in Nepal that invades forests, grasslands, fallow and agricultural

lands, and protected areas. It forms dense thickets that significantly reduce native plant species richness and diversity, suppress regeneration of tree seedlings, and alter plant community composition. In agricultural fields, it exhibits allelopathic effects that inhibit germination and growth of crops. The shrub modifies soil properties by increasing nitrogen, phosphorus, and organic carbon while reducing potassium, and it can reduce soil microbial diversity. Dense growth also affects forage availability in grasslands and changes fire regimes due to its high biomass. Within protected areas, such as Bardia National Park, *L. camara* reduces habitat quality for wildlife and is challenging to manage because it can rapidly resprout from stems and roots. Local communities perceive it as problematic due to its impacts on biodiversity, agriculture, and livestock forage, highlighting the need for integrated management strategies

Management options

Manual uprooting and repeated cutting before flowering and fruiting, applying herbicide directly to freshly cut stems so it moves into the roots and kills the plant without affecting nearby plants that suppressed larger patches. Limited trials with biological control agents, such as *Gonioctena* species and *Teleonemia scrupulosa*, showed moderate success in reducing plant vigor. Planting fast-growing native trees and grasses after clearing prevented reinvasion. Integrated approaches combining mechanical removal, herbicide use, biological control, restoration, and community participation have proved most effective for long-term control in Nepal and are supported by successful experiences in India, Australia, and South Africa.

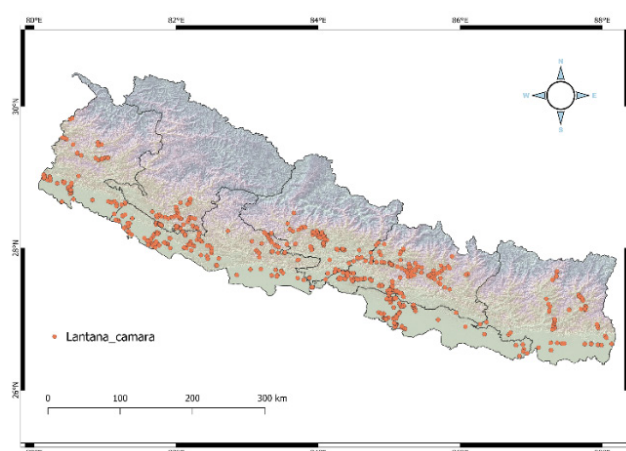


Figure 12: Distribution map of *Lantana camara* L. in Nepal.



करांते घाँस

Leersia hexandra
(KATH 031449)

Leersia hexandra Sw.

Common Name: Southern Cut Grass, Rice Grass

Local Name: Karaunte Ghans

Family: Poaceae

Habit and Habitat: Perennial grass growing in wetlands like lake, pond, marshes and in paddy fields.

Diagnostic features

Stem: Culms decumbent, rooting at lower nodes, erect shoots up to 50 cm or more tall, nodes pubescent.

Leaves: Leaf blades flat or sometimes rolled, abaxial surface scabrid on midrib, base contracted, apex sharply acute.

Flower: Panicle lanceolate-oblong in outline; Spikelets narrowly elliptic to elliptic-oblong, pale green or purple tinged.

Fruit/Seed: Minute caryopsis in spikelets.

Root: Root fibrous; adventitious roots from stem nodes.

Phenology

Flowering: May to December

Fruiting: May to December

Distribution

Native range: Tropical America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 100 to 800 m

Introduction pathway

Through the contaminant of agriculture products.

Impacts

It competes and replaces the native vegetation. It is also a serious weed of crop (like rice) where it reduces the crop productivity. It can form dense floating mat in wetlands, displace native species, and reduce light availability to phytoplanktons.

Management options

Management option for this weed includes cultural control by rotovating and puddling rice fields under inundated or dry conditions. And it can also be controlled by chemical method applying Glyphosate before land preparation in agriculture field.

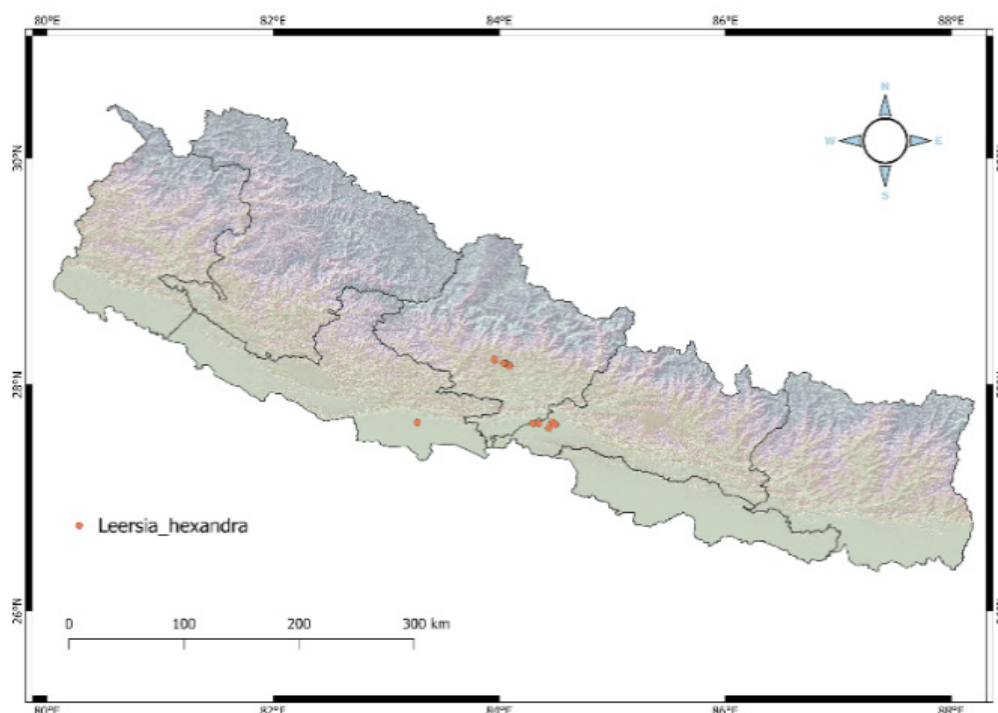


Figure 13: Distribution of *Leersia hexandra* Sw. in Nepal.



वन सिलास

a. *Mesosphaerum suaveolens* ×1

b. Flower ×5

Mesosphaerum suaveolens (L.) Kuntze

Common Name: American Mint

Local Name: Ban Silam, Tulsi Jhar, Silame Jhar, Vilayti Tulsi

Family: Lamiaceae

Habitat: Herbaceous weed growing in open, disturbed areas like forest edges, grasslands, and floodplains.

Diagnostic features

Stem: Strong and erect with branches. Spreading out and covered with rough, bristly hairs; quadrangular in outline.

Leaves: Leaf stalk thin, leaves oval or broadly oval, the upper side of the leaf is olive green, while the underside of the leaf has soft hairs. Base of leaf rounded or slightly heart-shaped, edges finely toothed, tip somewhat pointed or rounded.

Flower: Flowers white to pale pink; grow in small groups of 2-5, arranged in clusters or branched flower stalks, flowers with two lips, green outer part of the flower (sepal) is covered with soft hairs with tiny yellow glands, petals are blue and slightly hairy except near the base, tube part of flower is about 2 mm wide at the opening, upper part of the flower bends backward.

Fruit/Seed: Small with brown to black nutlets, flat (about 4 mm long and 3 mm wide) with tiny dots on the surface and two white scars at the base, turns sticky when wet.

Root: Tap root penetrated deep inside soil.

Phenology

Flowering: April to December

Fruiting: May to December

Distribution

Native range: Mexico to Tropical America

Distribution in Nepal: Tarai, Siwalik, and Middle Mountain region

Elevation range in Nepal: 100 to 1700 m

Introduction pathway

Accidental, Unintentional.

Impacts

It imposes a detrimental impact by reducing the number of species, diversity, richness, and evenness. In agricultural land, it can suppress the growth of the crop species, ultimately reducing productivity. It also causes socio-economic implications for the local people, such as depleted grazing areas for livestock and loss of useful plant species used by the local inhabitants. It also forms dense thickets that block sunlight and displace native plants. In addition, due to volatile oils present in the plant, it increases the risk of fire during the dry season.

Management options

As it forms a dense thicket, managing this weed is both challenging and costly. Regular plowing of the land and uprooting before flowering, can be used to manage this weed. In grasslands and open areas, controlled fire under safe conditions and replacement with competitive plant species, such as legumes, can promote native vegetation.

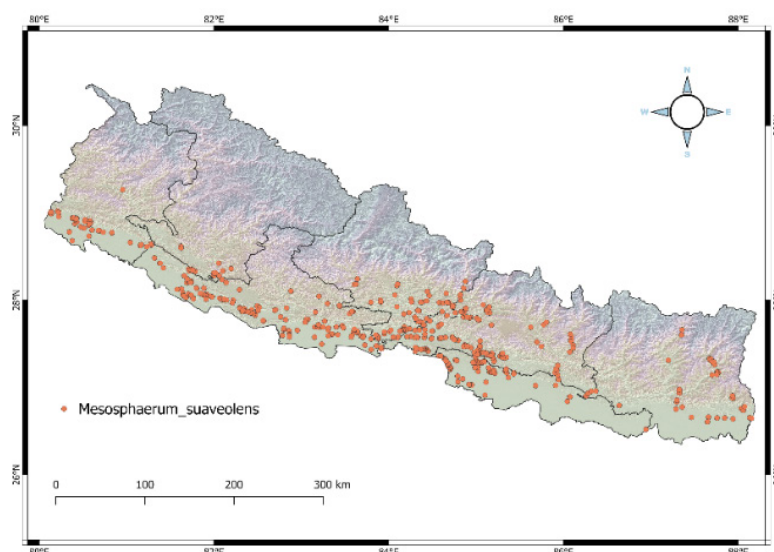


Figure 14: Distribution of *Mesosphaerum suaveolens* (L.) Kuntze in Nepal.

5 mm

b.

20 mm

a.

लहरे बनमारा

a. *Makania micrantha* ×1

b. Flower Head ×5

Mikania micrantha Kunth.

Common Name: Mile-a-minute, American rope

Local Name: Lahare Banmara, Pyangri Lahara, Tite Lahara, Bakhre Lahara

Family: Asteraceae

Habitat: Twining climber found mostly along forest margin, barren land, roadside, water course.

Diagnostic features

Stem: Slender, twining, herbaceous, and climbing vine; green to reddish-brown; smooth and glabrous; capable of rooting at nodes when in contact with soil.

Leaves: Opposite, triangular to heart-shaped (ovate), 4–13 cm long; base cordate, apex acute; margins serrated; petiole 3–7 cm long; surface glabrous with reticulate venation; emits a mild odour when crushed.

Flower: Small, white to pale pink; arranged in terminal or axillary clusters (corymbs or panicles); tubular florets without ray flowers.

Fruit/Seed: Small, brown to black, slender achenes (~2 mm long); each fruit bears a pappus of white bristles (5–6 mm) aiding in wind dispersal; highly prolific seed producer.

Root: Tap root system; stems develop adventitious roots at nodes upon contact with moist soil, facilitating vegetative propagation and rapid spread.

Phenology

Flowering: August to February

Fruiting: September to February

Distribution

Native range: Tropical and subtropical regions of Central America, South America (Neotropical origin)
Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 60 to 1400 m

Introduction pathway

Accidentally as contaminant of soil or agriculture produces; and intentionally as cover crop in palm and tree.

Impacts

Mikania micrantha has serious negative impacts on forests, agricultural lands, grasslands, rangelands, wildlife, and biodiversity. In forests, the vine grows rapidly, forming thick mats that cover and penetrate tree crowns, blocking sunlight and hindering the growth of native plants. This dense growth suppresses the

regeneration of native species, lowers species diversity, reduces forest biomass, and decreases carbon stock. When dried, the vine adds to the fuel load in forests, increasing the risk of fire. In agricultural lands, *M. micrantha* competes with crops for space, nutrients, and light, lowering yields and increasing labor required for weeding and management. In grasslands and rangelands, it spreads over the ground and replaces native grasses that serve as forage for livestock and wildlife, degrading habitats and reducing food availability. The vine also negatively affects the collection of non-timber forest products by making harvesting more difficult. Overall, the invasion of *M. micrantha* reduces biodiversity, weakens ecosystem health, lowers productivity of both natural and managed landscapes, and imposes additional management challenges for local communities.

Management options

Mikania micrantha requires a combination of methods for effective management. Uprooting or digging out the vine before it flowers and produces seeds can help control its spread, but simply cutting it only works for a short term because it grows back quickly. Increasing tree canopy cover also helps suppress the growth of the vine by limiting sunlight. In grasslands and open areas, controlled fire under safe conditions and replacement with competitive plant species, such as legumes or tall grasses, can reduce vine cover and promote native vegetation. Biological control using the rust fungus *Puccinia spegazzinii*, which causes leaf and stem necrosis, has been successfully applied in countries such as Fiji, Papua New Guinea, Taiwan, and Vanuatu. An integrated approach along with regular monitoring and early intervention, is considered the most sustainable strategy for controlling *Mikania micrantha* across forests, agricultural lands, and grasslands.

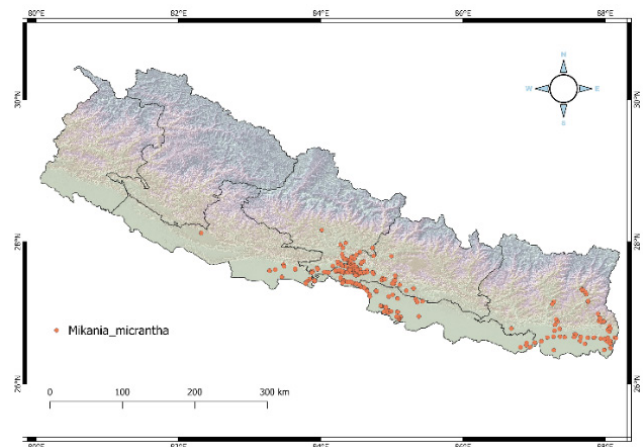
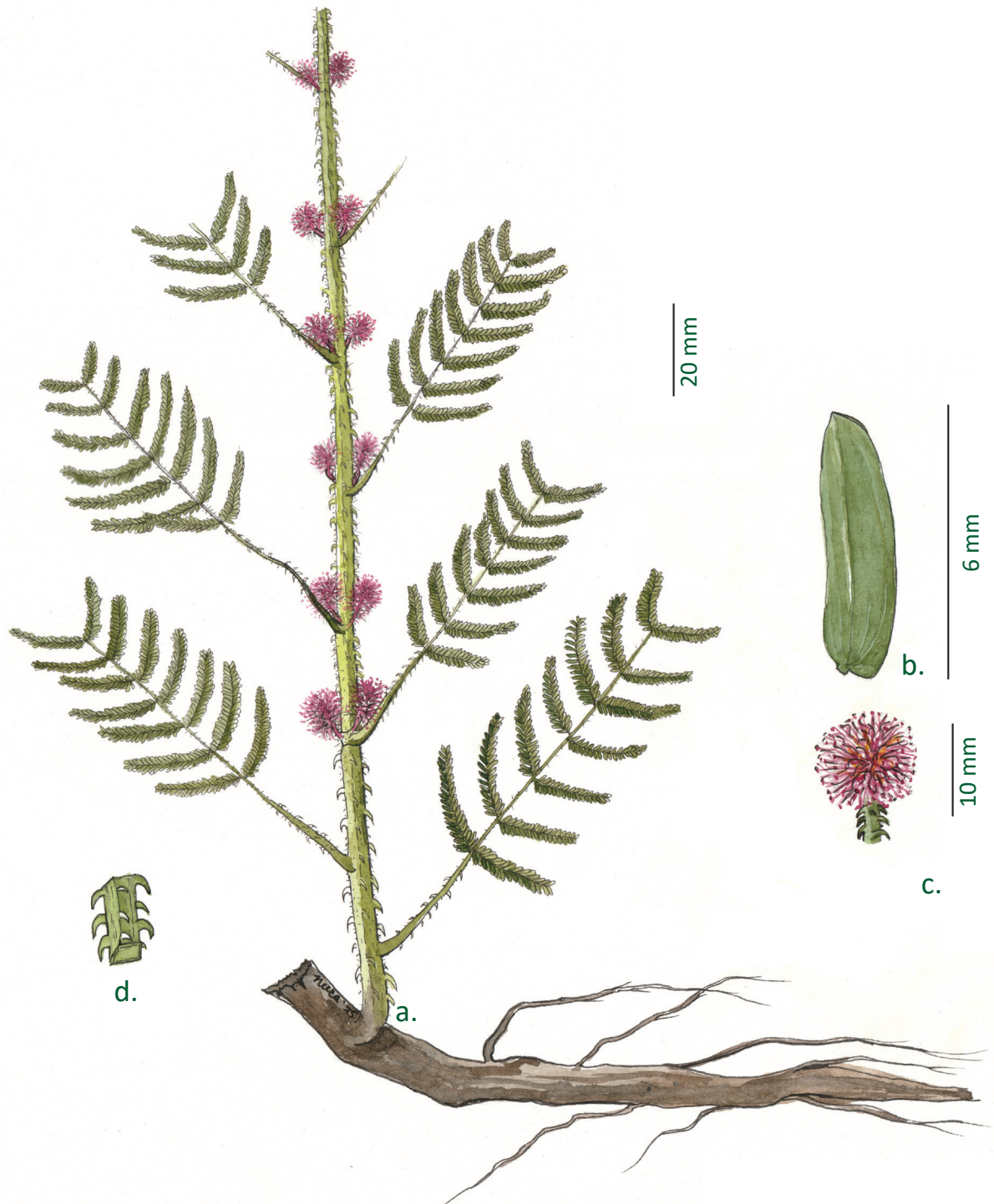


Figure 15: Distribution of *Mikania micrantha* Kunth in Nepal.



उल्टा काँडा

- a. *Mimosa diplotricha* $\times 1$
- b. Leaflet $\times 10$
- c. Flower $\times 2$
- d. Portion of Stem with Spines

Mimosa diplotricha C.Wright

Common Name: Giant Sensitive plant, Creeping Sensitive Plant

Local names: Ulta Kanda, Ara Kande, Bis Jhar, Thulo Lajjawati Jhar.

Family: Fabaceae

Habit and Habitat: Woody sub-shrub; commonly occurs along riverbanks, newly graveled roads and sand-heaps, and in disturbed sites such as abandoned fields, roadsides, forest fringes, agriculture and residential areas.

Diagnostic features

Stem: Slender, green to reddish-brown, twining and spreading; covered with fine hairs and small recurved prickles; capable of rooting at nodes when in contact with soil.

Leaves: Bipinnate, bright green, 6–12 cm long; each leaf has 8–14 pairs of pinnae, and each pinna bears 20–30 small leaflets; leaflets are narrow, oblong, and sensitive—folding quickly when touched or disturbed.

Flower: Small, pink to light purple, rounded (globular) heads about 1 cm across, borne in leaf axils; each head contains many tiny tubular florets.

Fruit/Seed: Narrow pods that break into small one-seeded pieces when dry; seeds small, brown, and flat. Each plant produces many seeds that can spread easily by wind, water, or attached to animals and vehicles.

Root: Tap root system with the ability to produce adventitious roots at stem nodes when in contact with moist soil. This feature allows the plant to spread rapidly and establish new shoots, enhancing its invasive potential.

Phenology

Flowering: October to December

Fruiting: November to February

Distributions

Native range: South America from Mexico to Argentina including Caribbean

Distribution in Nepal: Tarai and Siwalik region of Eastern Nepal (Jhapa, Morang, Sunsari and Sinduli districts)

Elevation range in Nepal: 65 to 500 m

Introduction pathway

Intentionally introduced (i.e., released) for soil bioengineering or as hedge plant.

Impacts

Mimosa diplotricha invades forests, riverbanks, roadsides, grasslands, rangelands, and agricultural lands in eastern Nepal. Its growth suppresses native seedlings and saplings, reducing plant diversity and altering ecosystem structure. The proliferation of this vine also interferes with livestock and wildlife movement, reduces available forage, and has been associated with livestock poisoning when consumed. The spiny thickets also restrict access to food and water for wild animals and make harvesting crops difficult, increasing labor and management costs while reducing yields. In addition, dried biomass adds to fire risk, and its spread can limit the collection of non-timber forest products.

Management options

Uprooting is only effective in small area and early stage of infestation. As the plant grows hand weeding becomes difficult due to its throne. Use of herbicide is reported to be effective.

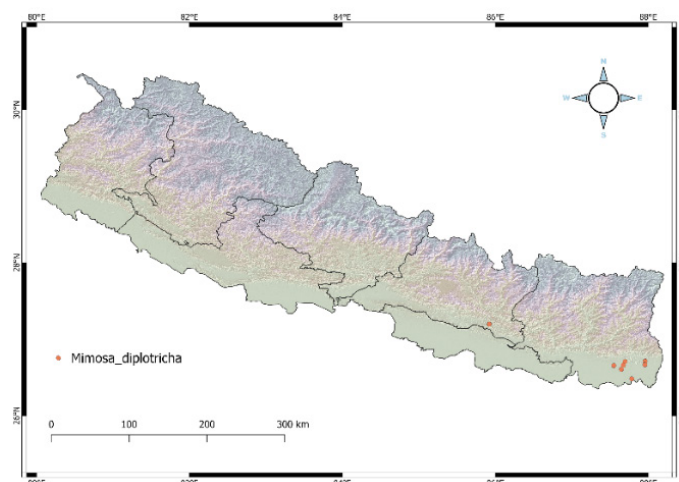


Figure 16: Distribution of *Mimosa diplotricha* C. Wright in Nepal.



लज्जावति का

- a. *Mimosa pudica* ×1
- b. Leaf ×2
- c. Flower ×2
- d. Fruit ×2

Mimosa pudica L.

Common Name: Touch-me-not plant, Common Sensitive Plant

Local Name: Lajjawati

Family: Fabaceae

Habit and Habitat: Herbs found mostly in agro-ecosystem, grassland, forest edge and flood plain.

Diagnostic feature

Stem: Covered with short or rough hairs. Prickles may be absent or, if present, point outward or slightly backward, and are found just below the nodes. Short lateral shoots (brachyblasts) are absent.

Leaves: Pinnately compound; Stipulate, Leaflets lanceolate.

Flower: Ovoid floral head with many minute flowers; number of the part of the perianth 4; calyx membranous, lobes triangular; petals with 1–3 veins, glabrous or pilose; stamens equal in number to petals; filaments pink.

Fruit/Seed: Legumes arranged in a star, slightly curved backwards; flat, oblong, consisting of 3 to 5, 1-seeded segments; bristly pods; seeds light brown, ovoid, around 3.5 mm.

Root: Taproot with some lateral roots; not very deep inside soil.

Phenology

Flowering: March to October

Fruiting: May to November

Distribution

Native range: Tropical region of Northern and Southern America including Mexico, Brazil, Caribbean

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 75 to 1500 m

Introduction pathway

Through the contaminant of agriculture produces.

Impacts

Mimosa pudica competes for the sunlight, water, nutrient and space with the crop plants in the crop field thereby reducing the productivity. Due to presence of pointed thorns it is difficult to work in the invaded crop fields. It also reduces the biodiversity by replacing native species of invaded area.

Management options

Hand weeding is difficult for its removal due to thorns present on it. Grazing by cattle like sheep helps to reduce its population to some extent. Herbicides like atrazine are more suitable for its control.

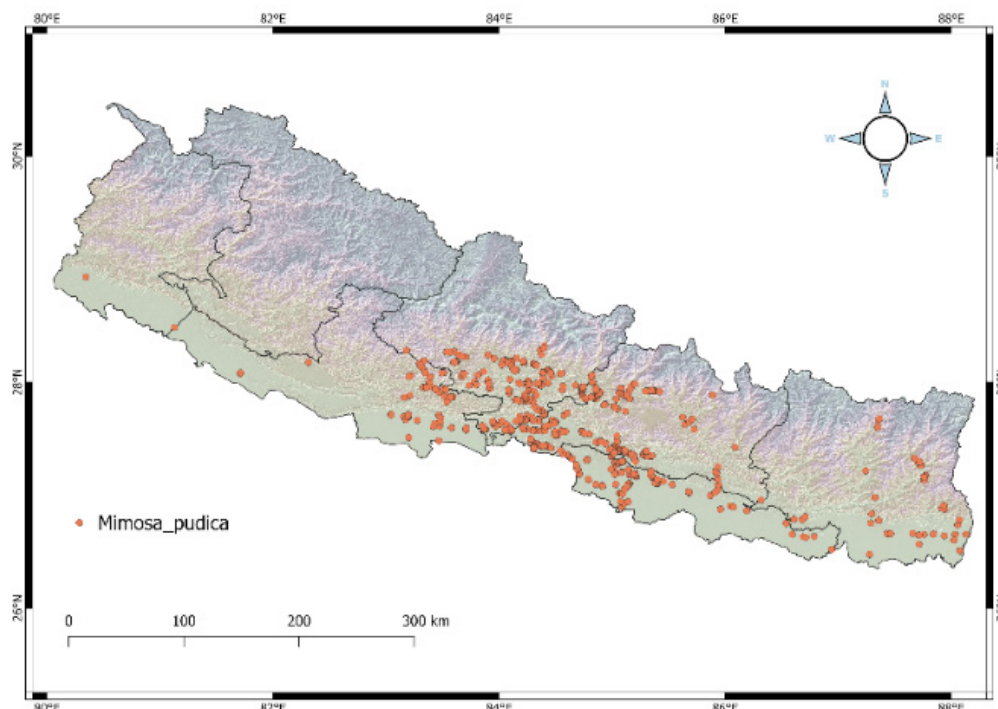


Figure 17: Distribution of *Mimosa pudica* L. in Nepal.



सुगा प्वाँखे

Myriophyllum aquaticum

Myriophyllum aquaticum (Vell.) Verdc.

Common Name: Parrot's Feather

Local Name: Suga Pwankhe

Family: Haloragaceae

Habit and Habitat: Aquatic herb found in wetlands like Ponds, Lake, Streams.

Diagnostic features

Stem: Simple or sparsely branched at base; cylindrical in outline.

Leaves: In alternating whorls, leaflets minute, linear.

Flower: Unisexual, creamy white in color; solitary in the middle and upper leaf-axils; with 1–2 lateral laciniae in male, laterally 1–2-dentate in female.

Fruit/Seed: Ovoid, longitudinally 4-sulcate.

Root: Adventitious roots coming from submerged stolons.

Phenology

Flowering: April to August

Fruiting: June to September

Distribution

Native range: South America

Distribution in Nepal: Middle Mountain region (Mainly Kathmandu Valley) of Central Nepal

Elevation range in Nepal: 1300 to 1500 m

Introduction pathway

Escape from ornamental introduction.

Impacts

This species can form large mats, which cover the water surface, reducing the native plant diversity, leading to communities numerically and taxonomically impoverished.

Management options

Physical or mechanical removal followed by complete decomposition of biomass to prevent further spread can be effective. *Myriophyllum aquaticum* regrows rapidly from shoot fragments so mechanical removal should be done carefully for effective management.

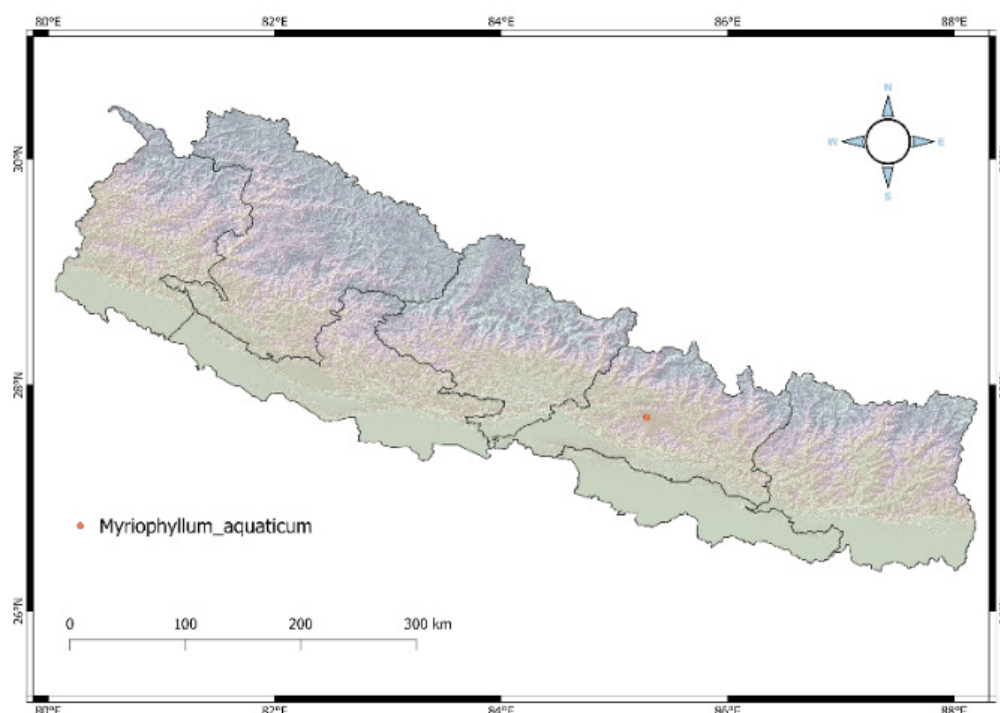
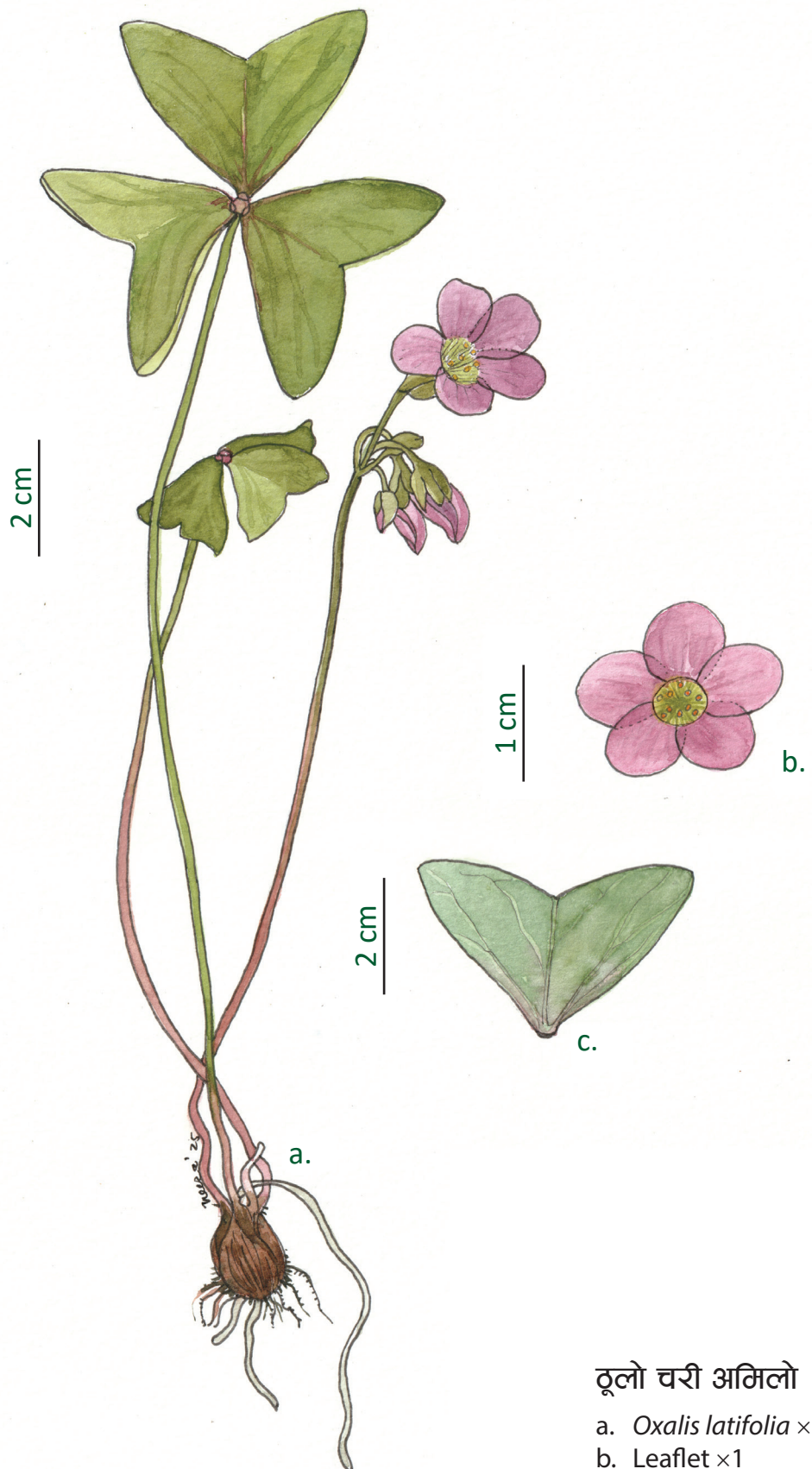


Figure 18: Distribution of *Myriophyllum aquaticum* (Vell.) Verdc. in Nepal.



तूलो चरी अमिलो

- a. *Oxalis latifolia* ×1
- b. Leaflet ×1
- c. Flower ×2

Oxalis latifolia Kunth.

Common Name: Broad Leaf Wood Sorel

Local Name: Thulo Chari Amilo

Family: Oxalidaceae

Habit and Habitat: Herbs found mostly in agro-ecosystem, grassland, and forest edge.

Diagnostic features

Stem: Modified into underground bulb; bulbs are ovoid.

Leaves: Trifoliate, leaflet heart shaped, lobes rounded glabrous green.

Flower: Purple to lavender pink flower in umbel like cyme.

Fruit/ Seed: Capsule cylindrical, glabrous with minute seeds in it.

Root: Fleshy tuber with fibrous roots.

Phenology

Flowering: February to September

Fruiting: February to September

Distribution

Native range: Central and South America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 600 to 2570 m

Introduction pathway

Contaminant of soil and agriculture produces.

Impacts

Oxalis latifolia reduces the agricultural productivity. Impact on native species, structure, composition, and regeneration due to alterations in the soil properties.

Management options

Use of herbicide is suitable for its proper management as it is difficult to remove by mechanical method from the field.

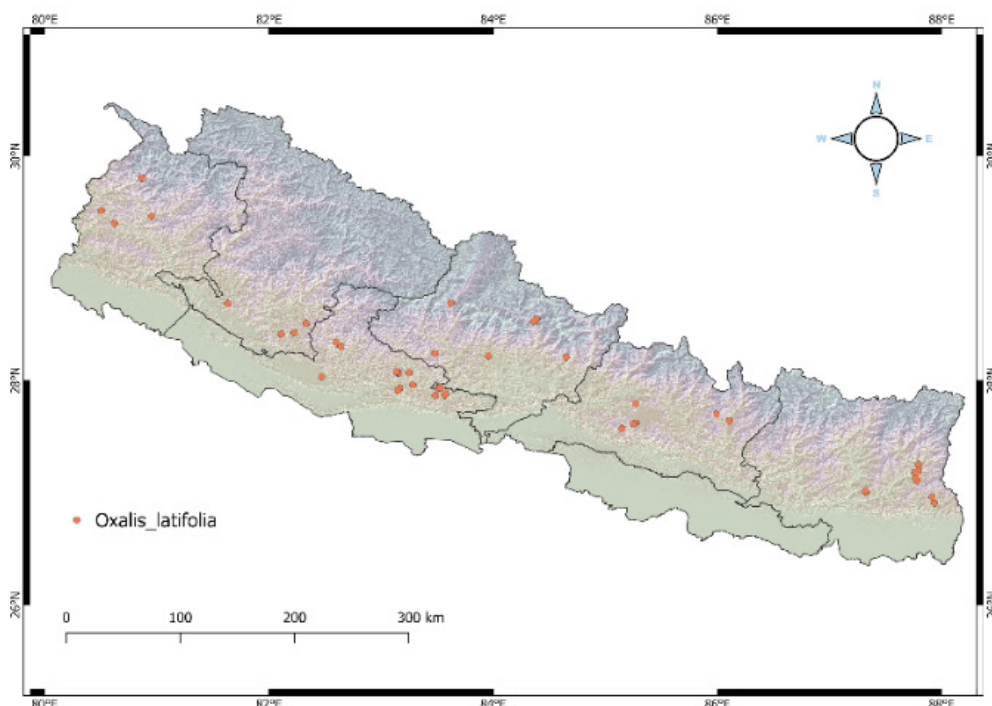


Figure 19: Distribution of *Oxalis latifolia* Kunth. in Nepal.



पाती झर

- a. *Parthenium hysterophorus* ×1
- b. Leaf ×1
- c. Front and lateral views of floral head ×2

Parthenium hysterophorus L.

Common Name: Santa-Maria feverfew, Carrot Grass, Whitetop

Local Name: Paati Jhar, Kanike Jhar, Gajare Jhar

Family: Asteraceae

Habit and Habitat: Herbs found mostly in agro-ecosystem, grassland, along roadsides and forest edge.

Diagnostic features

Stem: Erect with much branching in the upper half, hairy, and has small grooves.

Leaves: Hairy, highly dissected like titepati (*Artemisia*), but the smell is not aromatic; young individuals form a basal rosette in their early stage of growth.

Flower: Plant produce loose, branching clusters of flower heads. Flower heads small (1-10) mm in diameter) creamy white with unnoticable ray florets and central disc florets.

Fruit/Seed: Fruits are achenes. Each flower head usually contains five blackish seeds. Seeds are small achene, black, *ca.* 2 mm long, flattened, with two whitish pappus-like appendages. Single plant can produce more than 1,50,000 seeds. Easily spread by vehicles, animals, and water, and as a contaminant of agricultural products

Root: Deep tap root.

Phenology

Flowering: June to September (all year round at moist places)

Fruiting: July to September (all year round at moist places)

Distribution

Native range: Tropical America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 75 to 2140 m

Introduction pathway

Contaminants of agriculture products; stowaway (of transport vehicles).

Impacts

It is an aggressive colonizer, highly allelopathic, allergic to animals and humans, cause threat to crops and other native flora, degrades pasture by reducing forage production. It has strong allelopathic effect to the native plants. It changes species composition, soil nutrients and alter soil seed bank. It is a prominent allergenic plant causing asthma, allergic rhinitis, and contact dermatitis. It also taints the milk of dairy cattle.

Management options

Physical and mechanical control, such as uprooting before the flowering stage. Biological control using already established biological control agents like Leaf-feeding Mexican beetle (*Zygogramma bicolorata*) and winter rust (*Puccinia abrupta* var. *patheniicola*). The best method to manage this weed is an integrated weed management approach, utilizing cultural, physical, chemical and biological methods.

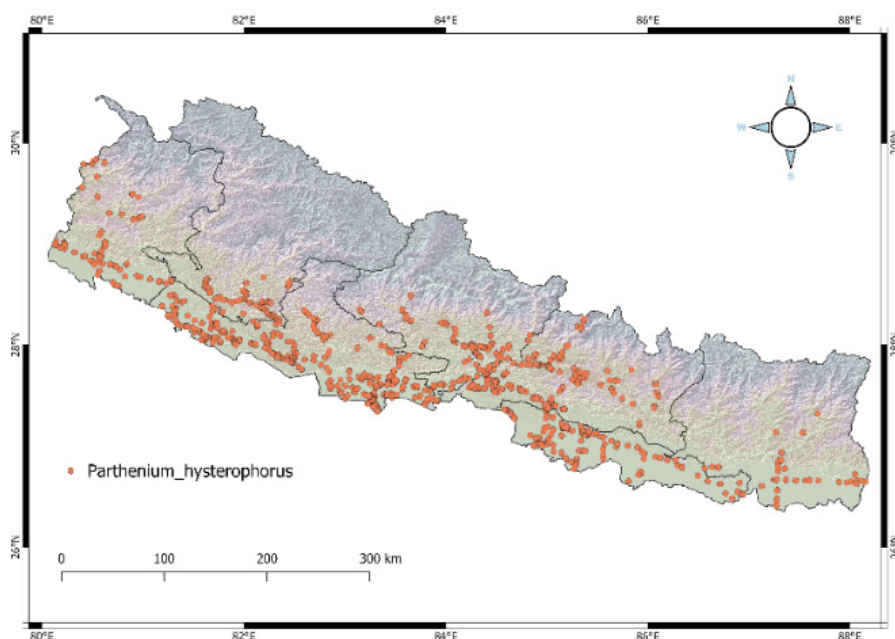


Figure 20: Distribution of *Parthenium hysterophorus* L. in Nepal.



कुठिभका
Pistia stratiotes

Pistia stratiotes L.

Common Name: Water Lettuce

Local Name: Kumbhika

Family: Araceae

Habitat: Aquatic free-floating herb found in pond, ditches and marshy lands.

Diagnostic features

Stem: Stoloniferous.

Leaves: Many in a rosette, thick, densely hairy, leaf blade obovate-cuneate to obovate-oblong, apex rounded to truncate.

Flower: Spadix enclosed in white spathe, flowers bisexual, male flowers located above female flowers.

Fruit/Seed: Oval green berries; seeds barrel shaped.

Root: Feathery, many, pendulous in water.

Phenology

Flowering: July to February

Fruiting: September to February

Distribution

Native range: South America

Distribution in Nepal: Tarai, Siwalik and Middle mountain region

Elevation range in Nepal: 70 to 1400 m

Introduction pathway

Escape from ornamental uses.

Impacts

Water lettuce grows rapidly forming thick mat like structure that prevents the sunlight and reduces the flora and fauna of invaded aquatic ecosystem. It is also highly problematic in irrigated paddy field where it reduces paddy production and increases weeding cost.

Management options

Water lettuce can be managed manually by hand pulling on small scale, but this will not ensure the complete elimination of the plant and re-establishment may occur. It can effectively be controlled by sulfonylurea herbicides like chlorsulfuron.

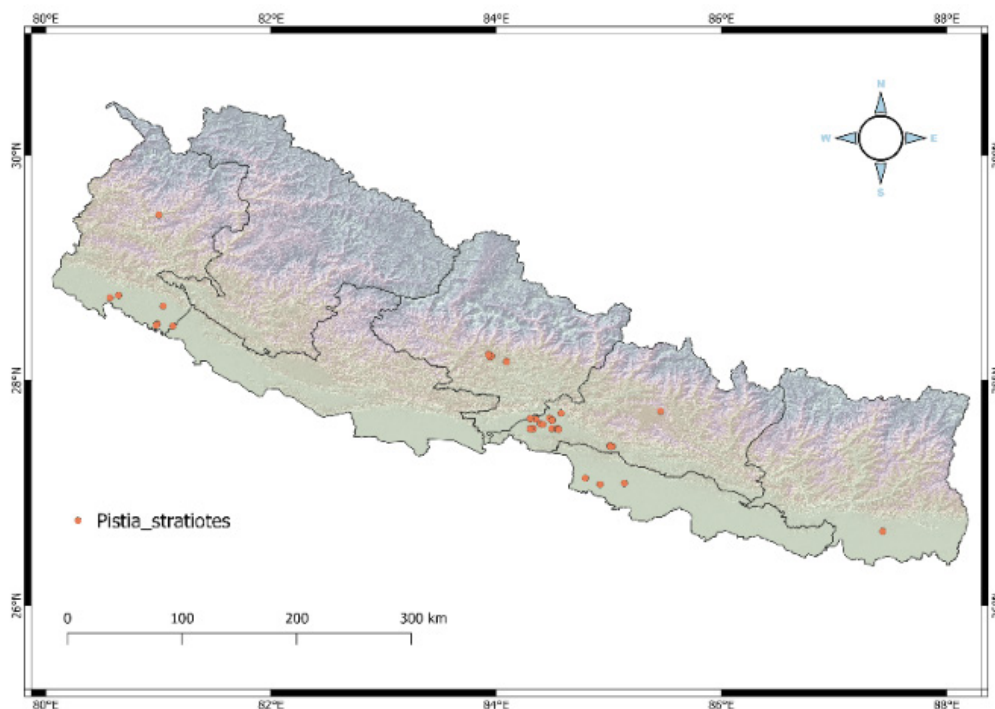


Figure 21: Distribution of *Pistia stratiotes* L. in Nepal.



जलकुम्भी

Pontederia crassipes ×1

Pontederia crassipes Mart.

Common Name: Water Hyacinth

Local Name: Jal Kumbhi

Family: Pontederiaceae

Habit and Habitat: Perennial aquatic herb, growing either free-floating or rooted in mud, commonly found in ponds, marshes and slow-moving streams.

Diagnostic features

Stem: Herbaceous; free-floating or rooted in mud; short stolon; stems variable depending on plant age and crowding.

Leaves: The plant has two types of leaves. The leaves above water have long, swollen stalks and broad blades that can be oval, round, or spade-shaped. The leaves under water are narrow and linear, attached alternately along the stem. Leaves grow in clusters on short rhizomes, are firm and leathery, and vary in size.

Flower: The plant has a flower spike with 8–10 flowers above the leaves. The flowers are funnel-shaped, blue or purple, with a dark blue and yellow spot in the middle

Fruit/Seed: When ripe, it splits open, becomes sticky, and breaks apart in water. It has many small, oval seeds with tiny ridges, but the seeds rarely grow.

Root: Numerous, long, feathery; dense in floating plants; support free-floating or rooted habit.

Phenology

Flowering: April to November (peaks vary with location, sometimes December to February)

Fruiting: June to December

Distribution

Native range: Native to South America

Distribution in Nepal: Tarai, Siwalik, and Middle Mountain region from east to west.

Elevation range: 75 to 1500 m

Introduction pathway

Introduced to Nepal primarily as an ornamental species for ponds, water gardens, and aquaculture due to its attractive flowers.

Impacts

Water hyacinth grows very fast and forms thick mats on rivers, lakes, and ponds. These mats block sunlight, reduce oxygen in water, and harm fish and other water animals. It spreads quickly, taking over space from native plants, and makes fishing, irrigation, and boat movement difficult. It also creates places for mosquitoes to breed, causing problems for people and the environment.

Management options

Water hyacinth in Nepal can be managed by mechanically removing mats, using biological control agents such as weevils and moths, turning harvested biomass into compost or feed, and combining these methods with community participation for long-term control.

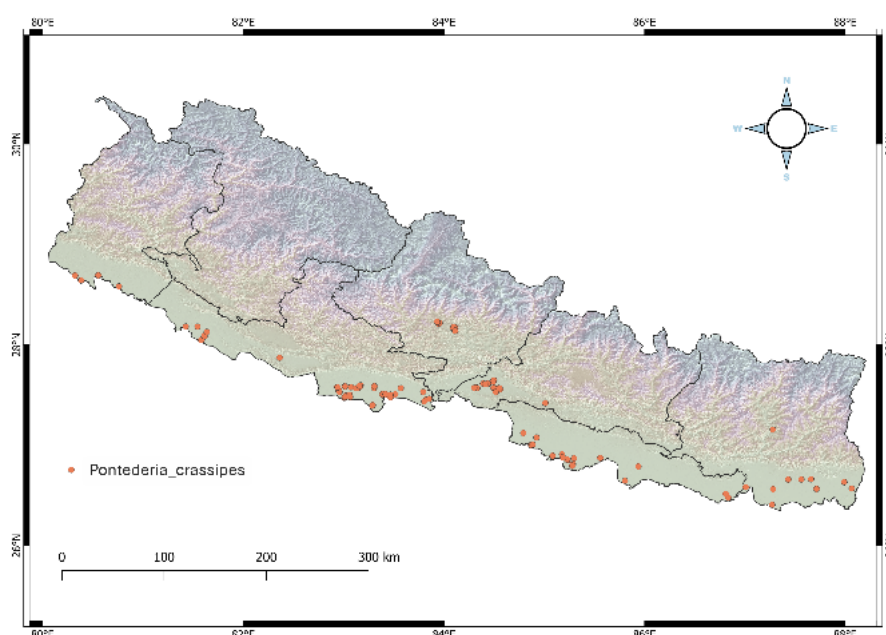


Figure 22: Distribution of *Pontederia crassipes* Mart. in Nepal.



तूलो टाप्रे

- a. *Senna occidentalis* ×1
- b. Leaf ×1
- c. Branch with fruits
- d. Flower ×2

Senna occidentalis (L.) Link

Common Name: Coffee Senna, Styptic weed

Local Name: Thulo Tapre

Family: Fabaceae

Habit and Habitat: An erect annual or perennial shrub/sub-shrub that grows mostly roadsides and on barren agricultural land.

Diagnostic features

Stem: Branched, glabrous, green, branches herbaceous, ribbed.

Leaves: Pinnately compound, each leaf having 3-6 pair of opposite leaflets, leaflets 2-10×2-4 cm, oblong-lanceolate, apex acuminate, base rounded, petiolule 1-2 mm, ovoid glands present near base of rachis.

Flower: Yellow flowers present on few flowered terminal or axillary corymbose raceme having 5 unequal sepals and 5 unequal petals.

Fruit/Seed: Cylindrical pods about 10-15 cm long having 20-30 oblong brown seeds.

Root: Tap root system.

Phenology

Flowering: April to October

Fruiting: May to December

Distribution

Native range: Tropical America

Distribution in Nepal: Tarai, Siwalik, and Low Mountain region

Elevation range in Nepal: 75 to 1400 m

Introduction pathway

Contaminant of soil and agriculture products.

Impacts

Senna occidentalis is poisonous to cattle and small herbivores, causing muscle, brain, and liver damage. Human toxicity is reported rarely, almost exclusively in children. It also inhibits the growth of native species and hence reducing the vegetation of that area.

Management options

Mechanical removal such as hand-pulling, hoeing, or tillage is most effective when applied at the seedling stage (before flowering and seed pod formation) preventing replenishment of the seedbank. Maintaining dense crop or pasture cover and avoiding over-grazing decreases colonization, since the species readily establishes on exposed soil surfaces. As it only reproduces through seed simply cutting the stem also helps in its control. Selective herbicides may be applied during early growth in heavily infested areas, but chemical control alone is insufficient.

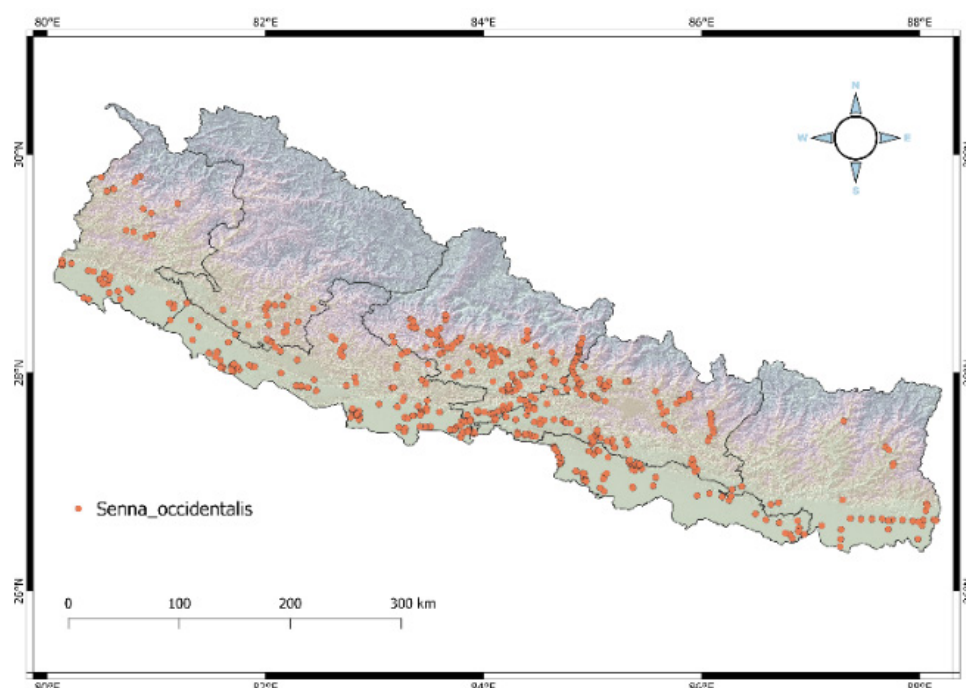


Figure 23: Distribution of *Senna occidentalis* (L.) Link in Nepal.



सानो टाप्पे

- a. *Senna tora* ×1
- b. Leaf with fruits ×1
- c. Flower ×2

Senna tora (L.) Roxb.

Common Name: Sickie Senna, Sickie Pod

Local Name: Sano Tapre

Family: Fabaceae

Habit and Habitat: Annual herb; mostly found along roadsides and grassland.

Diagnostic features

Stem: Slightly quadrangular, green, glabrous, much branched.

Leaves: Pinnately compound, mostly three pair of opposite leaflets per rachis measuring 3-5×2-3 cm, entire margin, apex rounded, base cuneate to oblique, petiolate present *ca.* 2 mm. slightly hairy both adaxial and abaxial surface.

Flower: Yellow flowers usually occurs in a pair from axil of leaves having 2-3 cm diameter; petals free, 5 in number, sepal free, 5 in number.

Fruit/Seed: Slender pod 10-15 cm long having 30-50 seed.

Root: Tap root.

Phenolgy

Flowering: April to September

Fruiting: May to November

Distribution

Native range: Central America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 75 to 1300 m

Introduction pathway

Contaminant of soil and agriculture products.

Impacts

Senna tora not only affects the agricultural lands, this species degrades pasture land by displacing native species.

Management options

Effective management requires integrated combined approaches. Mechanical control is effective when practiced early. Hand weeding or uprooting young plants before flowering is useful in small areas. In larger infestations ploughing at seedling stage can reduce weed population. Slashing or cutting before flowering prevents seed production, which is essential to reduce its spread.

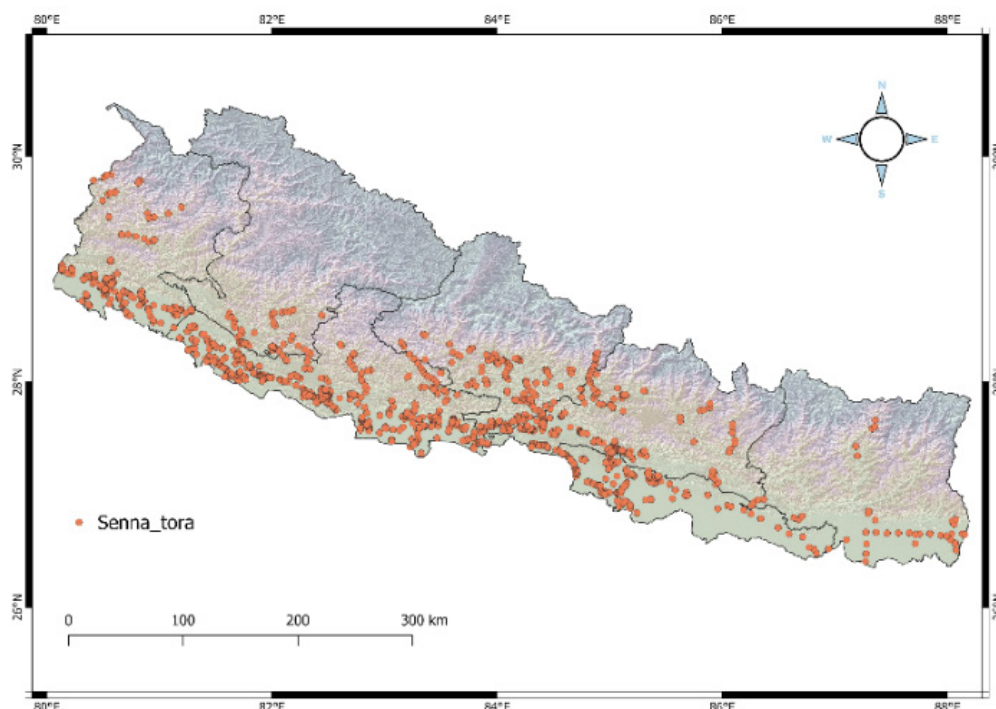


Figure 24: Distribution of *Senna tora* (L.) Roxb. in Nepal.



થાઢ્ઢને કાર
Spargula arvensis ×1
KATH 171233

Spergula arvensis L.

Common Name: Corn Spurry, Spurrey, Field Spurry

Local Name: Thangne Jhar, Bhote Jhar

Family: Caryophyllaceae

Habit and Habitat: Annual herb found in grassland, farmland and along roadside which spreads densely and rapidly.

Diagnostic features

Stem: Erect or ascending, green, glabrous, much branched.

Leaves: Leaves in false whorls, linear 10-25 mm having pointed tip (acute apex), membranous stipules at base.

Flower: Small white flowers in a loose cyme or solitary with 5 sepals and 5 petals.

Fruit/Seed: Capsule opening by 5 valves with numerous blackish brown seeds having narrow wing.

Root: Taproot system, with fine lateral roots.

Phenology

Flowering: January to March

Fruiting: February to April

Distribution

Native range: Europe

Distribution in Nepal: Middle Mountain region of Eastern and Central Nepal

Elevation range in Nepal: 700 to 2100 m

Introduction pathway

Release (introduced as winter forage).

Impacts

Spergula arvensis is one of the most serious weeds of cereals like wheat, barley, potatoes, mustard, and maize. It has a higher negative impact and decrease the yield of crops. It also alters the soil microprofile and soil nutrients. It spreads like a thick mat and hence reduces the soil nutrients of invaded area.

Management options

Spergula arvensis affects mostly agricultural fields i.e. cereal crops. Physical and cultural management option are more suitable and effective. Crop rotation helps to reduce its seed buildup. Use of clean and certified seed avoids contamination with this invasive weed. Hoeing the plants with root before formation of seed and burning them is effective. And as it is palatable to livestock, grazing young plants before flowering reduces biomass and prevents seed production.

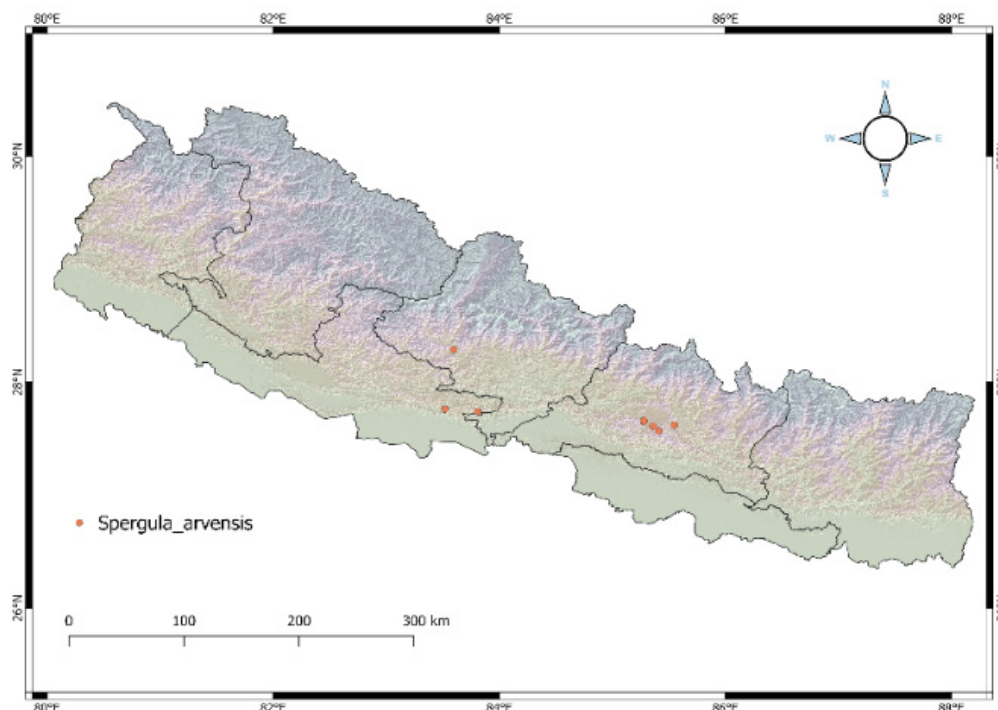


Figure 25: Distribution of *Spergula arvensis* L. in Nepal.



आलुपाते

Spermacoce alata ×1
KATH 168138

Spermacoce alata Aubl.

Common Name: Winged False Button Weed, Shiny Button Weed

Local Name: Aalupate

Family: Rubiaceae

Habit and Habitat: Perennial herb found on riverbanks, agroecosystem, along roadsides and disturbed sites.

Diagnostic features

Stem: Branched, erect or prostrate, herbaceous, glabrous, quadrangular, with prominent wings giving it a distinctive ridged appearance.

Leaves: Opposite decussate, elliptic to oblong-lanceolate, ca. 3-10 × 1-3 cm, margin entire; apex acute or acuminate; base attenuate or cuneate, sessile or petioles ca. 5 mm, stipulate, stipule interpetiolar.

Flower: Flowers in axillary or terminal clusters, white, small, bisexual, calyx 4 lobed, corolla tubular, 4 lobed.

Fruit/Seed: Capsule ovoid to ellipsoid splitting into two valves when mature having numerous minute oblong brown seeds.

Root: Tap root system, adventitious roots arising from nodes of prostrate stems.

Phenology

Flowering: June to November

Fruiting: July to December

Distribution

Native range: West Indies and Tropical America

Distribution in Nepal: Tarai, Siwalik and Middle Mountain region

Elevation range in Nepal: 200 to 2000 m

Introduction pathway

Contaminant of soil and agriculture products.

Impacts

Spermacoce alata forms the dense mat that replace the native species of that area adding the loss of biodiversity. Its dense mat sometimes reduces the crop germination capacity. It competes with the crops like maize, wheat, legumes and for nutrients, sun light and water. It also shows the allelopathic effect that suppress the growth of native species.

Management options

Spermacoce alata require an integrated strategy for its management due to its rapid reproductive capacity. The weed thrives in plantations, croplands, and roadsides and propagates mainly through seeds that persist in the soil seed bank. Mechanical control through hand-pulling or hoeing before flowering is effective for reducing future spread, but removal must include stem bases to prevent regrowth. Cultural measures such as maintaining dense crop canopies, mulching, intercropping, and crop rotation reduce seed germination and suppress competition.

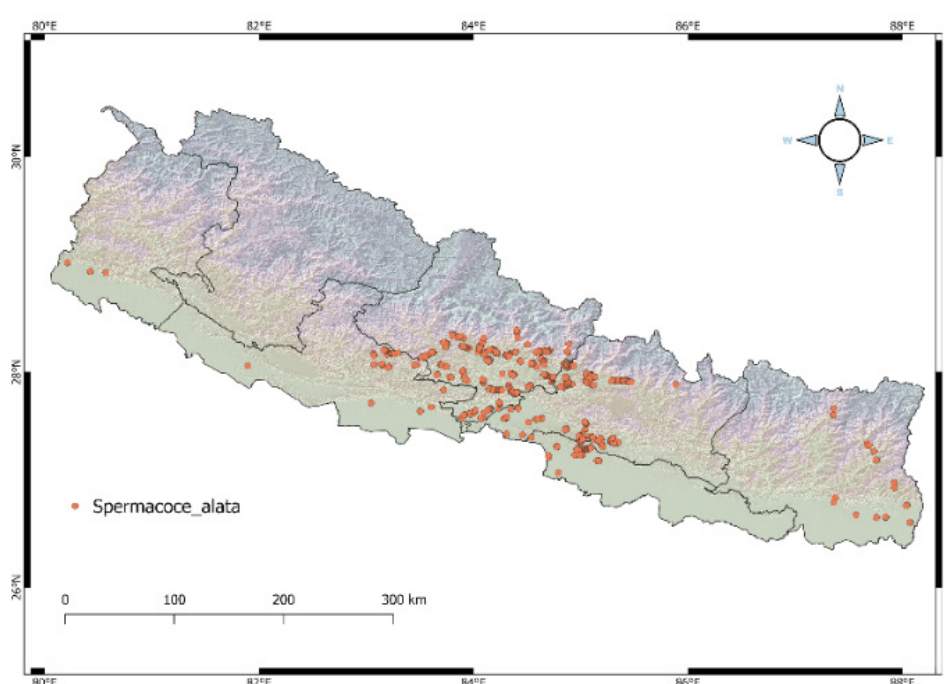


Figure 26: Distribution of *Spermacoce alata* Aubl. in Nepal.



सिंगापुर डेजी

Sphagneticola trilobata × 1
KATH 138134

Sphagneticola trilobata (L.) Pruski

Common Name: Singapur Daisy, Yellow Creeping Daisy, Creeping ox-eye, Trailing Daisy

Family: Asteraceae

Habit and Habitat: Perennial creeping herb found in wetlands, ponds and disturbed areas.

Diagnostic features

Stem: Prostrate or creeping with roots arising from the node, sparsely hairy.

Leaves: Opposite, simple; blades obovate to elliptic, usually 3-lobed (rarely 4), 3–8 × 2–5 cm wide; margin serrate; apex acute to obtuse; base cuneate; sessile or petiolate with petiole 5-10 mm; glabrous or sparsely pubescent.

Flower: Solitary, axillary or terminal capitulum on peduncle (5-10 cm), involucre green; phyllaries lanceolate, ciliate.

Ray floret: 4-8, showy, yellow, 15-20 mm, 3- or 4-denticulate, fertile.

Disk floret: Numerous, yellow, about 2 cm; corolla 5-6 mm

Fruit/Seed: Achenes; pyriform, blackish, angled 3-5 mm.

Root: Short-lived tap root system; adventitious roots arises from stem nodes, allowing the plant to spread vegetatively and form dense mats.

Phenology

Flowering: March to October

Fruiting: May to November

Distribution

Native range: Tropical America

Distribution in Nepal: Middle Mountain region (mostly in Kavre district) of central Nepal

Elevation range in Nepal: 600 to 900 m

Introduction pathway

Released for soil bioengineering; also introduced for ornamental uses with subsequent escape to natural habitats.

Impacts

Sphagneticola trilobata alters the chemical composition and microbial diversity by releasing chemical compounds. It obstructs the water flow of drainage lines and canals by growing extensively. It also prevents the growth of native species by blocking sunlight and competing for the nutrients available there.

Management options

Single method is not effective for the control of *Sphagneticola trilobata* and combination of chemical, mechanical, biological methods seems to be effective for its management. Removal of plant completely before flowering is the best way for its management. Its growth can be controlled by careful management of nitrogen fertilizer and irrigation and can also be efficiently controlled by eliminating some top soil using a suitable tool (such as a hoe) used to cut the roots and remove seeds.

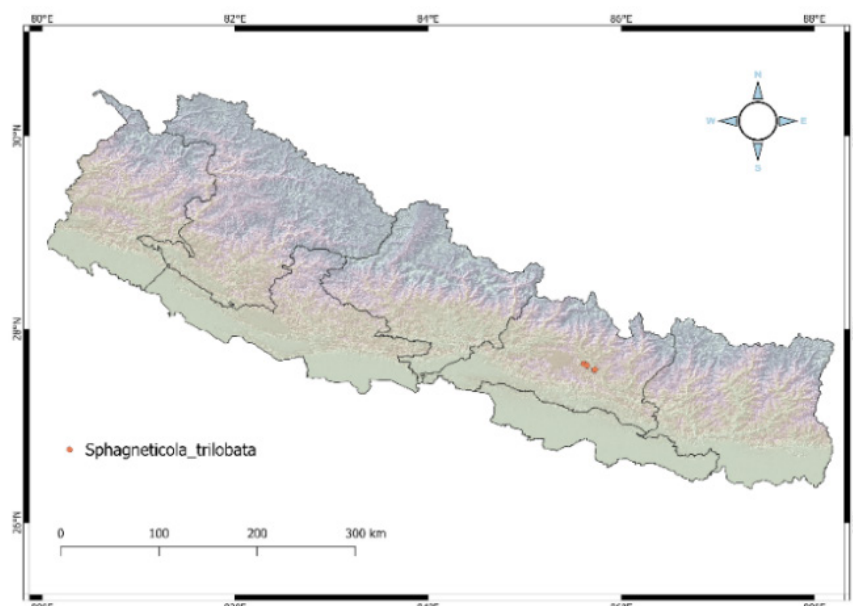


Figure 27: Distribution of *Sphagneticola trilobata* (L.) Pruski in Nepal.



जझली सूर्यमुखी

Tithonia diversifolia ×1
KATH 143294

Tithonia diversifolia (Hemsl.) A.Gray

Common Name: Mexican Sunflower

Local Name: Jangali Suryamukhi

Family: Asteraceae

Habit and Habitat: Erect, perennial shrub or sub-shrub found mostly on forest floor, also in shrubland and along roads/trails.

Diagnostic features

Stem: Erect, branched, hollow, cylindrical, slightly hairy.

Leaves: Mostly opposite, palmate (3-5) measuring 5-17 × 5-12 cm, margin crenate, apex acute, base attenuate, hairy on both sides, crenate margin.

Flower: Flowers head are solitary on a peduncle of 5-13 cm. Each mature branch may bear flower at their apex.

Ray floret: Bright yellow to orange-yellow, female, ligulate, 8–15 in number,

Disk floret: Numerous, tubular, bisexual, yellow to orange.

Fruit/Seed: Achenes, 3-4 ribbed, oblong, blackish or brown, about 4–5 mm long with two short awns.

Root: Tap root with numerous fibrous secondary roots.

Phenology

Flowering: October to January

Fruiting: December to February

Distribution

Native range: Mexico to Central America

Distribution in Nepal: Siwalik and Middle Mountain region from east to west Nepal

Elevation range in Nepal: 800 to 1500 m

Introduction pathway

Introduced as ornamental garden plant with subsequent escape to natural habitats.

Impacts

Tithonia diversifolia spreads extensively through its vegetative parts. It reduces the biodiversity of invaded area by outcompeting the native species. It affects the regeneration of native species by its allelopathic effect. It also affects the soil nutrient composition significantly. It spreads on the agricultural land and grassland thus reducing the agricultural yield and grazing value.

Management options

Tithonia diversifolia requires multiple methods for its proper management. Simple cutting of stem is not long term solution as it can generate through stem in no time. So, manual uprooting or digging out before flowering is appropriate method. Regular monitoring and follow up removal is often necessary. Increasing tree canopy cover suppress its growth by limiting the availability of light.

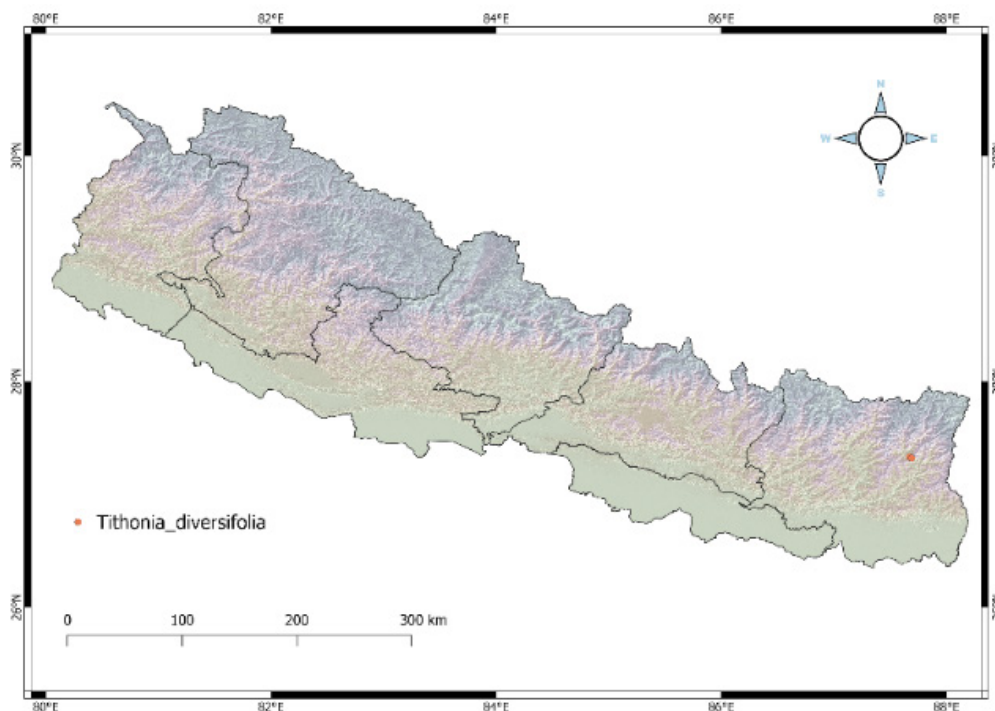


Figure 28: Distribution of *Tithonia diversifolia* (Hemsl.) A.Gray in Nepal.



મેહે કુરો

a. *Xanthium strumarium* ×1

b. Branch with fruits ×1

Xanthium strumarium L.

Common Name: Common Cocklebur

Local Name: Bhede Kuro

Family: Asteraceae

Habit and Habitat: Erect much branched annual herb found on grasslands, barren lands, on agriculture lands and on the margin of the forest.

Diagnostic features

Stem: Erect, much branched, hairy, usually reddish-green.

Leaves: Alternate; broadly ovate or triangular ovate, measuring 5–12×4–10 cm; margin irregularly dentate; apex acute to acuminate; base cordate; rough with densely hair on both sides; petiolate with petiole 3–7 cm.

Flower: Flowers are unisexual (male and female flower borne on different cluster).

Male flower: Male flowers are in terminal umbel, each head many-flowered, with tubular florets enclosed within an involucre having green bracts.

Female flower: Female flowers axillary, covered by hard spiny involucre, 2-beaked.

Fruit/Seed: Achenes enclosed in hard involucre, 2 achenes per involucre, one fertile and one sterile.

Roots: Thick tap root with few number of lateral roots.

Phenology

Flowering: July to August

Fruiting: September to October

Distribution

Native range: America

Distribution in Nepal: Tarai, Siwalik Middle Mountain and High Mountain region

Elevation range in Nepal: 75 to 2500 m

Introduction pathway

Hitch-hiked by humans and animals.

Impacts

Xanthium strumarium has adverse effect on the ecosystem where it grows. It inhibits the growth of other native plants found there. It affect severely on the cropland competing for the nutrition and mineral resources available there. It shows the allelopathic effects and significantly reduces the plant species richness and evenness in invaded areas. The burs of fruit damage animal wool and hides, reducing their market value. Contact with plant hairs and burs may cause skin irritation or dermatitis in humans and it damages the clothes of humans working on crop field and resources collectors in the forest.

Management options

Eradication of species from its invaded area is not easily possible however different methods have been applied for the control of its spread. Uprooting of species before its flowering and fruiting is best method for its control. The plant thus removed may be burned or buried to prevent its spread. Other methods includes crop rotation, intercropping, mulching and maintaining dense crop canopy for the control of this invasive species.

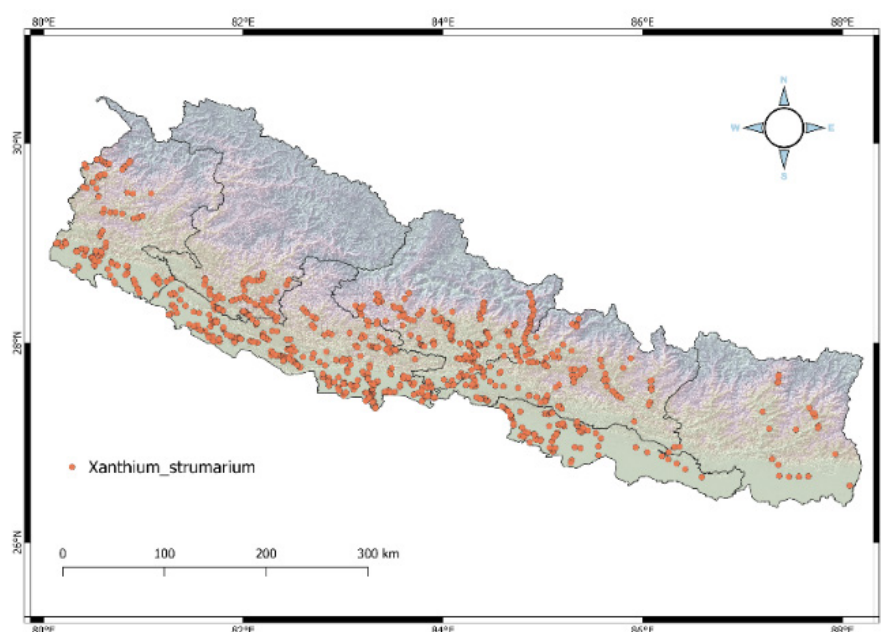


Figure 29: Distribution of *Xanthium strumarium* L. in Nepal.

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Annex 1: List of Invasive Alien Plant Species of Nepal

S.N.	Scientific Name	Family	Common Name	Local Name
1	<i>Ageratina adenophora</i> (Spreng.) R.M.King & H.Rob	Asteraceae	Crofton weed, Mexican Devil	Kalo Banmara, Banmasa
2	<i>Ageratum conyzoides</i> L.	Asteraceae	Billygoat Weed, White Weed	Seto Gandhe, Ganmane
3	<i>Ageratum houstonianum</i> Mill.	Asteraceae	Floss Flower, Blue Billygoat Weed	Nilo Gandhe
4	<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Amaranthaceae	Alligator Weed	Jaljambu, Patpate
5	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Spiny Pig-weed	Kande Lude, Ban Lude
6	<i>Argemone mexicana</i> L.	Papaveraceae	Mexican Prickly Poppy	Thakal, Sungure kanda
7	<i>Bidens pilosa</i> L.	Asteraceae	Beggar's Ticks	Kuro, Kalo Kuro
8	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	Asteraceae	Siam weed	Seto Banmara
9	<i>Erigeron karvinskianus</i> DC.	Asteraceae	Mexican Fleabane	Phule Jhar
10	<i>Galinsoga quadriradiata</i> Ruiz & Pav.	Asteraceae	Shaggy Soldier	Jhuse Chitlange
11	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Bush Morning Glory	Besharam, Ajambari
12	<i>Lantana camara</i> L.	Verbenaceae	Wild Sage, Red Sage	Kirne Kanda, Kande Banmara
13	<i>Leersia hexandra</i> Sw.	Poaceae	Rice Grass, Southern Cut Grass	Karaute Ghans
14	<i>Mesosphaerum suaveolens</i> (L.) Kuntze	Lamiaceae	American Mint, Bush Mint	Ban Silam
15	<i>Mikania micrantha</i> Kunth.	Asteraceae	American Rope, Mile-a-Minute	Lahare Banmara
16	<i>Mimosa diplotricha</i> C.Wright	Fabaceae	Giant Sensitive plant, Giant Mimosa	Uta Kanda
17	<i>Mimosa pudica</i> L.	Fabaceae	Sensitive plant, Touch-me-not plant	Lajjawati Jhar
18	<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	Haloragaceae	Parrot Feather, Brazilian Water-milfoil	Suga Pwankhe
19	<i>Oxalis latifolia</i> Kunth	Oxalidaceae	Broad leaf wood sorrel	Thulo Chari Amilo
20	<i>Parthenium hysterophorus</i> L.	Asteraceae	Carrot Grass, Congress Grass	Pati Jhar
21	<i>Pistia stratiotes</i> L.	Araceae	Water Lettuce	Kumbhika
22	<i>Pontederia crassipes</i> Mart.	Pontederiaceae	Water Hyacinth	Jal Kumbhi
23	<i>Senna occidentalis</i> (L.) Link	Fabaceae	Coffee Senna, Negro Bean,	Thulo Tapre
24	<i>Senna tora</i> (L.) Roxb.	Fabaceae	Sickle Senna, Sickle Bean	Sano Tapre, Tapre
25	<i>Spergula arvensis</i> L.	Caryophyllaceae	Spurrey, Field Spurrey	Thangne Jhar
26	<i>Spermocoe alata</i> Aubl.	Rubiaceae	Winged False Button Weed, Shiny Button Weed	Aalupate
27	<i>Sphagneticola trilobata</i> (L.) Pruski	Asteraceae	Singapore Daisy, Creeping Ox-eye	Singapur daisy
28	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	Asteraceae	Mexican Sun Flower	Jangali Suryamukhi
29	<i>Xanthium strumarium</i> L.	Asteraceae	Common Cocklebur	Bhede Kuro



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Ministry of Forests and Environment
Forest Research and Training Centre
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