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HABITAT PREFERENCES AND POPULATION DYNAMICS OF THE INVASIVE *AMBROSIA ARTEMISIIFOLIA* L. IN ORDU PROVINCE IN TÜRKİYE

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Abstract

Invasive plant species establish in new habitats outside their natural ranges, often leading to ecological, economic, and public health impacts. *Ambrosia artemisiifolia* L. (ragweed), native to North America, is a major invasive species due to its competitive growth and highly allergenic pollen, which can induce hay fever and asthma. This study represents the first record of the species in Ordu province and aims to determine its distribution, habitat preferences, and population characteristics within Ordu, Türkiye. Field surveys were conducted during August–September 2021, the peak phenological period of the plant. Sampling took place at 1–2 km intervals along roadsides, rubble debris areas, riverbanks, non-agricultural lands, and hazelnut orchards. Plant density (plant/m²) and percent cover were measured using a 0.25 m² quadrat. The species was recorded for the first time in Ordu, forming populations at 20 locations: 16 on roadsides and four in rubble debris areas. A total of 27 plant species belonging to 12 families were identified in the surveyed habitats. *A. artemisiifolia* was the dominant species, with a mean cover of 24%. The most frequent co-occurring species were *Conyza canadensis* (L.) Cronquist, *Sambucus ebulus* L., *Xanthium strumarium* L. and *Convolvulus arvensis* L. Although ragweed was not detected in hazelnut orchards, the presence of all associated species as common weeds in these areas suggests a high future invasion risk. Overall, the findings indicate that ragweed is primarily concentrated in anthropogenic habitats, and its spread is likely facilitated by transportation and soil movement. Given its ecological competitiveness and strong allergenic impacts on human health, early detection, regular monitoring, and effective control strategies are essential to prevent further expansion.

Key words: Invasive plant; Ordu; Population status; Ragweed; Roadside; Survey

Introduction

In recent years, climate change driven by global warming has led to profound transformations within ecosystems. In addition to these shifts, the removal of geographical barriers has accelerated the movement of species beyond their natural distribution ranges, creating new threats to biological diversity. Technological advances in transportation, communication, trade, and tourism have considerably increased human and material mobility compared to previous decades (Emerton & Howard, 2008; Cunze *et al*., 2013; Case & Stinson, 2018; Inci *et al*., 2025). Combined with rapid population growth and the intensification of human activities, these developments represent major drivers of large-scale environmental changes that challenge ecosystem stability. One of the most notable consequences of these changes is the increasing spread of invasive alien species, which pose significant risks to biodiversity (Bozdoğan *et al*., 2021; Xiao-Li *et al*., 2021).

Species transported to new regions outside their native ranges can cause severe ecological, economic, and health-related impacts on the ecosystems they invade (Scalera *et al*., 2012; Uludağ *et al*., 2013; Uremiş *et al*., 2014). By competing with native flora, they disrupt habitat structure, reduce agricultural productivity, and negatively affect human health. Among these species, *Ambrosia artemisiifolia* L. (ragweed) has gained prominence in recent years due to its rapid spread, particularly in agricultural areas, and the risks its pollen poses to human health (Knolmajer *et al*., 2024).

Native to North America, *A. artemisiifolia* has expanded across multiple continents. Although the species lacks an inherent active dispersal mechanism, its seeds are known to be transported by wind, water, birds, agricultural machinery, and various human-mediated activities. Its pollen exhibits strong allergenic properties and triggers respiratory disorders such as hay fever and asthma (Uludağ *et al*., 2017; Knolmajer *et al*., 2024).

A. artemisiifolia was first recorded in Türkiye in 1995 in Trabzon province, and over the past two decades it has expanded its distribution across the western and eastern Black Sea regions, as well as Thrace, with more limited occurrences in the Central Black Sea region (Byfield & Baytop, 1998; Zambak & Uludağ, 2019). A survey conducted from Sinop province to the Georgian border reported that the species was particularly concentrated in the east of Rize province, and due to habitat degradation associated with the Black Sea Coastal Highway that had accelerated its spread (Önen *et al*., 2013; Önen *et al*., 2014; Önen *et al*., 2015). Studies carried out in the Thrace region and in the provinces of Düzce and Giresun revealed that the species was widespread along roadsides, forested areas, rangelands, and non-agricultural lands, whereas its density is relatively lower in agricultural fields (Ozaslan *et al*., 2016; Karaköse *et al*., 2018; Zambak & Uludağ, 2019). Ragweed typically occupies disturbed habitats, including roadsides, rubble debris areas, stream and forest margins, and abandoned lands, and can occur across elevations ranging from 0 to 1000 m (Önen *et al*., 2015; Karaköse *et al*., 2018; Zambak & Uludağ, 2019; Hemiş & Kolören, 2025).

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Since 2004, *A. artemisiifolia* has been listed as an Invasive Alien Species by EPPO (European and Mediterranean Plant Protection Organization) (Anon., 2021; Anon., 2021). It is a summer annual herbaceous species belonging to the Asteraceae family. Ragweed typically reaches 120–140 cm in height and has a highly branched, densely pubescent stem and a taproot system (Zambak & Uludağ, 2019; Knolmajer *et al*., 2024). Its leaves exhibit morphological variation depending on the developmental stage, and the species may be confused with *Tagetes patula* (french marigold), *Solanum lycopersicum* (tomato), and *Artemisia vulgaris* (common mugwort) (Kazinczi *et al*., 2009). Germination usually begins in May, reproductive development occurs between August and October and its seeds can remain viable for many years (Chikoye *et al*., 1995; Brandes & Nitzsche, 2007;). Ragweed typically prefers open and human-disturbed habitats and is commonly found as a persistent invasive companion species in construction and roadside environments. It is generally absent from undisturbed habitats. Sandy and acidic soils are considered favorable for its growth (Bašić *et al*., 2017).

In Türkiye, particularly in the Black Sea region, the species has exhibited increasing density and frequency in recent years. As an invasive species, it has also spread into the Marmara and Central Anatolia regions (Önen *et al*., 2015). Significant populations have been identified in both the western and eastern parts of northern Türkiye; however, no concrete data are available regarding its population density or distribution in Ordu province, which largely lies within the Central Black Sea region. Due to its ecological, economic and public health impacts, *A. artemisiifolia* has become an important invasive weed in fields, rangelands and roadside habitats in Türkiye. Chemical control has been reported as the most effective management method against this invasive species in both agricultural and non-agricultural areas. Herbicides can effectively suppress seedling emergence and early growth stages; however, due to the species' high seed production capacity and prolonged germination period, control success largely depends on application timing and repeated treatments (Önen *et al*., 2015; Bozdoğan et al., 2018; Zambak & Uludağ, 2019; Yonat & Kolören, 2023).

Therefore, the present study aims to document the population presence of *A. artemisiifolia* in Ordu province and to determine its distributional range, morphological characteristics, and taxonomic position. Additionally, the study seeks to assess whether the species has infested agricultural areas in Ordu province and to evaluate its potential risks to human health in light of the existing literature.

Description of the survey area

The province of Ordu is located between 40°18′–41°08′ N latitudes and 36°52′–38°12′ E longitudes, with a total area of 5,952 km². It is bordered by the Black Sea to the north, Samsun to the west, Giresun to the east, and Tokat and Sivas to the south. The region is predominantly mountainous, with the Canik Mountains and the Pontic Mountain Range forming its major highlands. These mountains extend parallel to the coastline and their elevations increase from west to east. Deep valleys and high plateaus have been shaped by rivers cutting through these mountain ranges, and many of these plateaus contain prominent peaks. Ordu experiences a typical Black Sea climate characterized by mild summers and cool winters. However, in the inland districts, the effect of increasing elevation results in colder temperatures and substantial snowfall in higher areas such as the Çambaşı Plateau. Precipitation occurs in nearly all months of the year (Yeşil *et al*., 2021). The agricultural soils of the province are generally acidic, with low pH values (Özkutlu *et al*., 2016; Yonat & Kolören, 2025).

Material and Methods

Material: The primary material of the survey study consisted of *A. artemisiifolia* populations occuring in disturbed habitats (e.g., roadsides, vacant lands and rubble debris areas) within the province of Ordu, along with other weed species co-occurring in disturbed habitats. During the fieldwork GPS was used for determining the elevation and geographic coordinates of sampling sites; a 0.25 m² (50 cm×50 cm) quadrats were made for weed density measurements; photographs were also taken in the field. The collected specimens were deposited in Ordu University herbarium.

For the correct identification of *A. artemisiifolia* specimens collected from hazelnut orchards, the sources *Flora of Turkey and the East Aegean Islands* (Davis *et al*., 1988) and *Biological Flora of the British Isles: A. artemisiifolia* (Essl *et al*., 2015) were consulted. The English names of weed species were obtained from the Anon., (2025) database.

Considering the phenological stage of *A. artemisiifolia*, field surveys were conducted in Ordu province during August and September 2021 at the beginning of seed set. Along the survey routes, stops were made approximately every 1-2 km to record the location, density and percent cover of ragweed populations, as well as the other weed species present in the same habitats. During weed assessment, sampling areas of at least one decare that best represented each location was selected and a 0.25 m² (50 cm × 50 cm) quadrat was randomly placed 6 times to perform the counts. In monocotyledonous weed species, stem counts were taken, whereas in dicotyledonous and non-seed vascular plants, root counts were used (Önen & Özer, 2001).

Surveys were carried out in potential habitats for the species, including roadsides, disturbed and rubble areas, riverbanks, coastal zones, hazelnut orchards, and non-agricultural lands. For each location, weed species, their densities (plant/m²), and estimated percent cover values were recorded. The formulas used for these calculations are provided below (Odum, 1971; Uygur, 1991).

The species coverage (SC %) is the average value at which any weed species covers the soil surface. It is divided into a general coverage area (GCA).

$$GCA\ (\%) = SC/m$$

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SC: The sum of the area occupied by each species,
m: the total number of samples.

Density (plant/m^2): Weed densities were calculated using the arithmetic mean. For each location, the total number of individuals counted for each weed species was divided by the total sampled area of that location to determine the density (plant/m^2) (Odum, 1971; Uygur, 1991).

Results

Habitat and distribution: Surveys were conducted across potential habitats of *A. artemisiifolia* in Ordu province and its districts, including roadsides, rubble debris areas, riverbanks, coastal zones, hazelnut orchards and non-agricultural lands. As a result of the survey, ragweed populations were recorded from 19 locations in Altınordu district and at 1 location in Fatsa district. Detailed information on these locations, including district, coordinates, elevation, and habitat type, is presented in Table 1. Among the recorded sites, 16 were roadsides and 4 were rubble debris areas. The species was generally observed at low elevations and predominantly in habitats close to the sea. In this study, ragweed was most commonly found in areas associated with human activity and transportation, such as roadsides. No individuals were observed in hazelnut or kiwi orchards during the survey period.

The ragweed species forms higher population densities in disturbed habitats and areas influenced by anthropogenic activities rather than by natural environments. In the present survey, conducted in Ordu province, partly located in the Eastern Black Sea region, and partly in the Central Black Sea region, the species was primarily found along roadsides and in adjacent disturbed/rubble areas (Fig. 1). The population dynamics of the species are high and, as shown in Fig. 1(a, b, c, d), it has reached very dense populations within the community, demonstrating its invasive potential. Additionally, satellite images of the surveyed locations are provided in Fig. 1, indicating that the species was particularly abundant in the central district of Altınordu.

During the 2021 field surveys in Ordu province, a total of 27 weed species belonging to 12 families were recorded as co-associates with *A. artemisiifolia* within the same communities (Table 2). The recorded weed species belonged to the divisions Pteridophyta (one species) and Spermatophyta (Angiospermae), including 6 monocotyledons and 20 dicotyledons. Among these species, one was a tree (*Robinia pseudoacacia*), one was a shrub (*Rubus canescens* DC.) and the remaining species were herbaceous. Among the recorded species, the family Asteraceae was the most dominant with 9 species, followed by Poaceae with 6 species, and Amaranthaceae and Solanaceae with 2 species each. The remaining families were represented by a single species. Within the communities ragweed exhibited the highest cover and density. The species with the next highest cover and density were *C. canadensis, S. ebulus, X. strumarium* and *C. arvensis*, respectively.

The cover percentage (%) and density (plant/m^2) of *A. artemisiifolia* as an invasive species were analyzed across habitat types using one-way ANOVA. The results indicated that habitat type had a statistically significant effect on both variables, with higher density and cover values recorded in roadside habitats compared to rubble debris areas. The effect of elevation on population distribution was examined using linear regression analysis, which revealed a significant negative relationship between elevation and both density and cover percentage.

Taxonomic classification and morphological characteristics: *Ambrosia artemisiifolia*, belongs to the division Magnoliophyta (Angiospermae). Based on cotyledon number, it is classified in the class Magnoliopsida, which includes dicotyledonous species. - It is just a basic and does not suit for a reserch paper. Rewrite Phylogenetically, it is assigned to the subclass Asteridae, which contains composite-flowered plants, and to the order Asterales. The species is a member of the family Asteraceae (Compositae), one of the largest plant families worldwide, characterized by capitulum-type inflorescences and numerous taxa. – too fundamental Within this family, it belongs to the subfamily Asteroideae. At the genus level, *Ambrosia* L. comprises approximately 40 species, mostly annual, anemophilous (wind-pollinated) weeds. Ragweed, one of the world’s most important invasive weeds, is native to North America. Its synonyms include *A. elatior* L. and *A. artemisiifolia* var. *elatior* (L.) Descourt.

Ambrosia artemisiifolia is an annual (therophyte) herbaceous species, typically ranging from 30 to 160 cm in height. Its stem is erect, cylindrical, and frequently highly branched. Young individuals are green and pubescent, whereas mature stems develop brownish longitudinal stripes. The species has a taproot system capable of penetrating well-drained soils, which enhances its tolerance to drought conditions. Leaves are alternately arranged and generally bipinnately divided two to three times, with each leaflet narrow, thin, and deeply lobed. The leaf surface is lightly pubescent, with a higher density of trichomes on the abaxial surface than on the adaxial side. These morphological adaptations help reduce water loss, enabling survival in semi-arid environments (Fig. 2). Flowering occurs from August to September. The plant is monoecious, producing separate male and female inflorescences on the same individual. Male heads are arranged in racemes at the stem tips, yellowish-green in color, and produce abundant pollen. Female heads are located in the leaf axils, either singly or in small cluster. Pollen grains are spherical with an echinate surface and an aerodynamic shape, facilitating long-distance wind dispersal.

Discussion

A. artemisiifolia is an invasive plant species that exerts significant environmental, economic, and health-related impacts on a global scale (Vilà *et al*., 2011; Essl *et al*., 2015). Native to central and northern North America, the species has expanded over the past two centuries to Europe, Asia, and Australia through various human-mediated pathways (Richardson *et al*., 2000; Xiao-Li *et al*., 2021). Its rapid spread is attributed to its high ecological plasticity, ability to germinate across a broad range of climatic conditions, and the long-term viability of its seeds (Cunze *et al*., 2013; Case & Stinson, 2018). According to Anon., (2021), ragweed currently exhibits extensive distribution across many regions outside its native range. Although its natural range is restricted to North America, the species has established invasive populations in several parts of Europe, Asia, Australia, and South America, as illustrated in Fig. 3. The figure shows that the species forms stable populations (indicated in orange) particularly across Europe, whereas temporary or localized populations (indicated in purple) are present in parts of Asia and the Southern Hemisphere (Anon., 2021; Essl *et al*., 2015; Cunze *et al*., 2013).

Table 1. Geographic information regarding the locations where *A. artemisiifolia* was observed.

Location number	District/Neighborhood	Coordinate	Elevation (m)	Habitat
1	Altınordu/Turnasuyu neighborhood	40°58'38.45"K, 37°59'44.26"D	5	rubble debris areas
2	Altınordu/Cumhuriyet Neighborhood	40°58'48.50"K, 37°58'13.27"D	5	roadsides
3	Altınordu/Cumhuriyet Neighborhood	40°58'37.94"K, 37°56'14.11"D	4	roadsides
4	Altınordu/Cumhuriyet Neighborhood	40°58'22.51"K,37°57'47.93"D	7	rubble debris areas
5	Altınordu/Cumhuriyet Neighborhood	40°58'17.01"K, 37°56'28.19"D	6	roadsides
6	Altınordu/Karapınar Neighborhood	40°57'23.36"K, 37°55'53.90"D	10	roadsides
7	Altınordu/Karapınar Neighborhood	40°58'7.09"K, 37°55'43.96"D	6	roadsides
8	Altınordu/Durugöl Neighborhood	40°58'33.92"K, 37°55'50.07"D	6	roadsides
9	Altınordu/Durugöl Neighborhood	40°58'49.96"K, 37°55'24.61"D	4	roadsides
10	Altınordu/Akyazı Neighborhood	40°58'59.21"K, 37°54'27.36"D	2	roadsides
11	Altınordu/Karşıyaka Neighborhood	40°58'29.57"K, 37°54'54.67"D	8	roadsides
12	Altınordu/Karşıyaka Neighborhood	40°58'24.95"K, 37°54'9.47"D	3	roadsides
13	Altınordu/Karşıyaka Neighborhood	40°58'1.54"K, 37°54'27.43"D	3	rubble debris areas
14	Altınordu/Eskipazar Neighborhood	40°57'11.54"K, 37°53'52.98"D	21	roadsides
15	Altınordu/Eskipazar Neighborhood	40°56'22.57"K, 37°53'16.93"D	47	roadsides
16	Altınordu/Eskipazar Neighborhood	40°57'32.56"K, 37°54'0.76"D	19	rubble debris areas
17	Altınordu/Şahincili Neighborhood	40°58'1.28"K, 37°53'57.07"D	34	roadsides
18	Altınordu/Şahincili Neighborhood	40°58'10.70"K, 37°53'17.75"D	69	roadsides
19	Altınordu/Şahincili Neighborhood	40°58'15.79"K, 37°52'58.17"D	89	roadsides
20	Fatsa/Kurtuluş Neighborhood	41° 1'25.74"K, 37°31'24.94"D	7	roadsides

Table 2. Families, scientific and English names, habit, densities (D) and general coverage area (GCA) of plant species co-occurring with *A. artemisiifolia* in the surveyed communities (CABI, 2021).

Family	Scientific name	English name	Habit	D (plant/m^2)	GCA (%)
Adoxaceae	*Sambucus ebulus* L.	Danewort	Perennial	6,55	12,97
Amaranthaceae	*Amaranthus retroflexus* L.	Pigweed	Annual	1,15	2,28
	Chenopodium album L.	goosefoot	Annual	0,55	1,09
Apiaceae	*Oenanthe pimpinelloides* L.	Branched water dropwort	Perennial	0,35	0,69
Asteraceae	*Ambrosia artemisiifolia* L.	Ragweed	Annual	11,95	23,66
	Artemisia vulgaris L.	Common mugwort	Perennial	2,10	4,16
	Bidens frondosa L.	Beggarticks	Annual	0,10	0,20
	Tussilago farfara L.	Colt's foot	Perennial	0,15	0,30
	Cichorium intybus L.	Chicory	Annual	0,10	0,20
	Conyza canadensis (L.) Cronquist	Butterweed	Annual	8,15	16,13
	Lactuca scariola L.	Compass plant	Annual-biennial	0,05	0,10
	Taraxacum officinale F. H. Wigg.	Blowball	Perennial	0,15	0,30
	Xanthium strumarium L.	Rough cocklebur	Annual	3,35	6,63
Convolvulaceae	*Convolvulus arvensis* L.	Small bindweed	Perennial	2,85	5,64
Equisetaceae	*Equisetum arvense* L.	Common horsetail	Perennial	0,70	1,39
Fabaceae	*Robinia pseudoacacia* L.	Black locust	Perennial	0,10	0,20
	Medicago sativa L.	Lucerne	Perennial	0,15	0,30
Poaceae	*Setaria viridis* (L.) P. Beauv.	Green bristlegrass	Annual	1,60	3,17
	Sorghum halepense (L.) Pers	Aleppo grass	Perennial	0,95	1,88
	Echinochloa cruss-galli (L.) P. Beauv.	Barnyard grass	Annual	2,15	4,26
	Lolium perenne L.	English ryegrass	Perennial	0,80	1,58
	Poa annua L.	Annual meadowgrass	Annual	0,45	0,89
	Paspalum dilatatum Poir.	Gold-crown grass	Perennial	0,55	1,09
Polygonaceae	*Persicaria hydropiper* (L.) Delabre	Water pepper	Annual	1,05	2,08
Rosaceae	*Rubus canescens* DC.	Brambles	Perennial	0,20	0,40
Solanaceae	*Datura stramonium* L.	Common thorn apple	Annual	0,30	0,59
	Solanum nigrum L.	Black nightshade	Annual	0,15	0,30
Urticaceae	*Urtica dioica* L.	Common nettle	Perennial	1,05	2,08

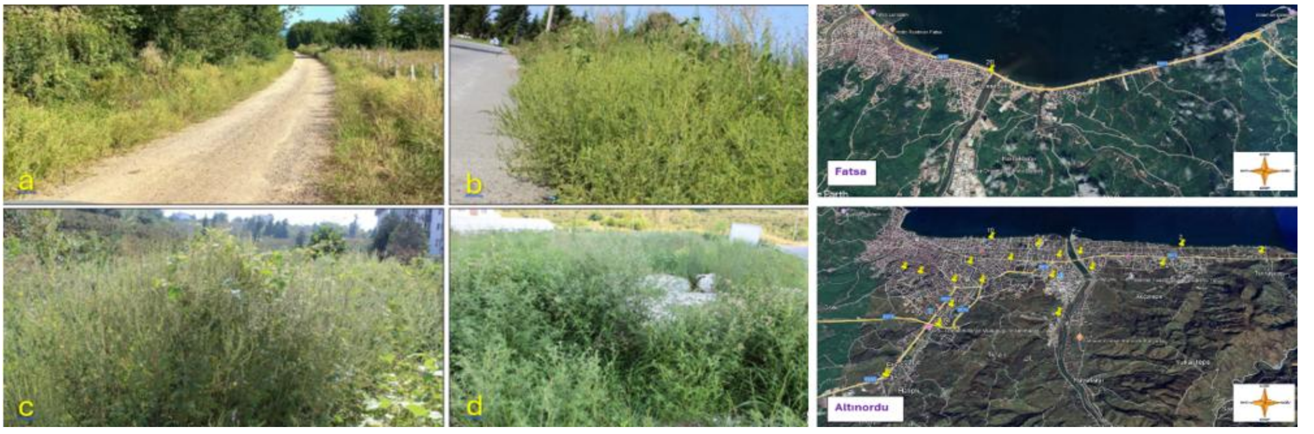

Fig. 1. Spatial distribution of *A. artemisiifolia* within the community and its locations in the districts: (a) both sides of the road; (b) one side of the road; (c) area adjacent to hazelnut orchards; (d) rubble debris area.

Fig. 2. Morphological features of *A. artemisiifolia*: (a) leaf; (b) flowering shoots; (c) seed; (d) root and stem.

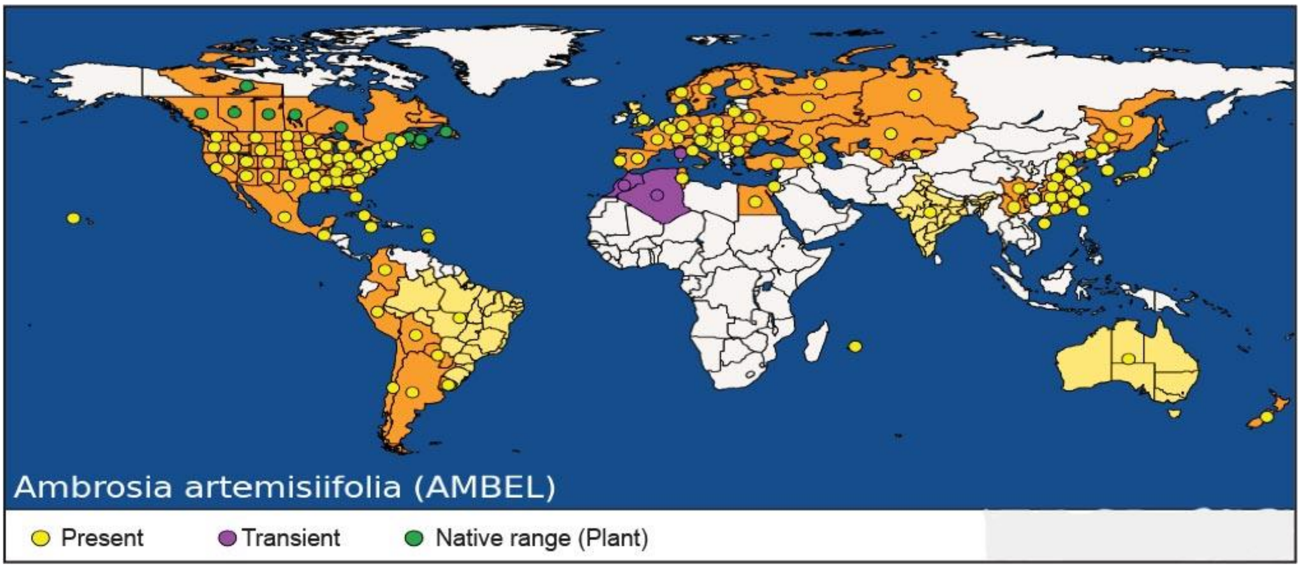

Fig. 3. Global distribution of *Ambrosia artemisiifolia* (Anon., 2021; Essl *et al*., 2015; Cunze *et al*., 2013).

A. artemisiifolia was first recorded in Trabzon province in Türkiye (Byfield & Baytop, 1998) and is classified as a non-native species in national databases (Uludağ *et al*., 2017; Anon., 2021; Anon., 2021). Recognized as a major invasive species in Europe, ragweed has been the focus of numerous studies conducted across Europe and within EU member states, including the Anon., (2016) project. One of the most significant ecological and health-related impacts of this species is its production of highly allergenic pollen capable of triggering severe, potentially life-threatening allergic reactions in humans. For this reason, international initiatives such as the International Ragweed Society (IRS) have been established to enhance global awareness and support research efforts (Anon., 2021). In Türkiye, the increasing distribution of the species and the associated health risks linked to pollen-induced allergies highlight – repetition - the need for improved management and monitoring strategies. This clearly demonstrates the importance of ragweed in terms of both local ecosystem integrity and public health. In addition to its ecological impacts, the species poses serious risks to human health. Its pollen exhibits strong allergenic properties and can cause respiratory diseases such as allergic rhinitis, conjunctivitis - repetition, and asthma (Essl *et al*., 2015; Makra *et al*., 2015). Notably, in regions with high pollen concentrations, increased respiratory risks have been observed among vulnerable groups such as the elderly and children (Emerton & Howard, 2008). Therefore, controlling the spread of the species is crucial not only from an ecological standpoint but also for safeguarding public health.

The first detection of *A. artemisiifolia* in Ordu is ecologically significant, as it indicates the continued eastward expansion of the species along the northern coastal corridor of Türkiye. The humid climate and alluvial soils of the Black Sea region provide highly suitable conditions for germination and early growth (Önen *et al*., 2015) and previous reports from Giresun (Karaköse *et al*., 2018) and Düzce (Zambak & Uludağ, 2019) confirm comparable habitat preferences. Collectively, these findings suggest the emergence of a continuous invasion pathway throughout the Eastern Black Sea coast. In Ordu, the species was primarily recorded along roadsides and disturbed sites, aligning with international observations that highlight its strong association with anthropogenic habitats (Brandes & Nitzsche, 2007; Ortmans *et al*., 2016).

Human-mediated dispersal remains the dominant driver of the species' spread. Agricultural machinery, transportation networks, soil movement, and road construction can facilitate long-distance seed dispersal (Makra *et al*., 2015). The presence of dense populations in Altınordu supports the hypothesis that transportation corridors function as major dispersal vectors, a pattern also documented in North America and Europe (Kazinczi *et al*., 2009; Vila *et al*., 2011). Natural dispersal processes also contribute, including wind, flooding, and bird-mediated transport (Emerton & Howard, 2008). Anon., (2021) reports that ragweed is among the most rapidly spreading invasive plants in Europe, with an estimated annual expansion rate of 10–20 km.

Numerous studies demonstrate that ragweed exhibits high competitive ability, reduces native plant diversity, and dominates disturbed habitats through rapid growth, high pollen production, and long-lived seed banks (Chikoye *et al*., 1995; Bašić *et al*., 2017; Case & Stinson, 2018). The coexistence of the species with other widespread weeds such as (*Conyza canadensis*, *Sambucus ebulus*, *Xanthium strumarium*) in Ordu indicates shared ecological niches, reinforcing the notion of strong competitive interactions within disturbed plant communities (Vilà *et al*., 2011; Essl *et al*., 2015).

Early studies from Türkiye (Uygur, 1991; Ozaslan *et al*., 2016) have documented severe infestations in agricultural systems, particularly sunflower fields in Thrace region, suggesting that ragweed poses significant risks to crop production. Although the species has not yet invaded hazelnut or kiwifruit orchards in Ordu (Yonat & Kolören, 2017; Yonat & Kolören, 2025), its current presence along field margins indicates a high likelihood of future spread into cultivated areas if preventive measures are not implemented. Modeling studies from Europe predict a northward expansion of suitable habitats under changing climatic conditions (Cunze *et al*., 2013; Ortmans *et al*., 2016), positioning coastal provinces such as Ordu as highly vulnerable to future invasion.

The concentration of populations in low-elevation coastal zones is consistent with the species' climatic tolerance, characterized by optimal performance in temperate and humid environments (Makra *et al*., 2015). Enhanced wind exposure in these areas may further facilitate pollen and seed dispersal (Rands *et al*., 2010). While the species has not yet established in agricultural habitats possibly due to ecological constraints or early invasion stage roadsides and vacant lands may function as long-term seed reservoirs, eventually enabling the species to expand into crop systems (Emerton & Howard, 2008).

Overall, the presence of *A. artemisiifolia* in Ordu suggests a new phase in invasive species dynamics along northern Türkiye. The species' ecological plasticity, human-assisted dispersal pathways, and ongoing climatic shifts collectively increase the likelihood of further expansion (Uluğ *et al*., 1993; Cunze *et al*., 2013; Essl *et al*., 2015; Xiao-Li *et al*., 2021). Accordingly, long-term monitoring programs and coordinated management strategies involving local authorities are essential to mitigate future ecological and agricultural impacts.

Single-seeded achene (cypsela) hardens at maturity and bears spiny projections measuring 2–4 mm in length and typically has 5-7 short spines at the apex. Once mature, the achenes are easily dispersed and can remain viable in the soil for many years. This characteristic represents a key ecological advantage contributing to the species' invasive potential.

Conclusion

This study evaluated the distribution and habitat characteristics of *A. artemisiifolia* in Ordu province, providing insights into the species' ecological behavior in the region. The findings indicate that the species is primarily associated with degraded habitats experiencing intense human activity, such as roadsides and debris sites. Its higher abundance in coastal districts suggests that transportation networks (both terrestrial and maritime) and coastal environments play an important role in facilitating its spread. The absence of the species in agricultural areas indicates either that its invasion is still at an early stage or that existing management and weed control practices in these areas are effective. – The ecological preference of this species is a distributed area Nevertheless, the presence of dense roadside populations points to the potential for the species to expand from these disturbed habitats into agricultural landscapes, representing a noteworthy early-warning signal. Community-level assessments show that *A. artemisiifolia* tends to become dominant wherever it occurs, suppressing coexisting plant species and gaining a clear competitive advantage. Its high seed production capacity, long-lived soil seed bank, and rapid growth rate further reinforce its invasive potential. Considering the climatic characteristics and geographical features of the region, the species is likely to expand into broader areas in the future. In conclusion, although *A. artemisiifolia* currently exhibits a limited distribution in Ordu province, it has established stable populations in the areas where it occurs. The suitability of regional environmental and climatic conditions suggests a continued risk of future range expansion. Therefore, early intervention, regular monitoring, and enhanced public awareness should be prioritized to prevent the species from exerting increasing negative impacts on ecosystem balance and human health.

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