

Management of Giant Ragweed (*Ambrosia trifida*): A Bibliometric Analysis of the Literature

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Abstract

- Over the last three decades, *Ambrosia trifida* (Giant Ragweed) has become one of the most persistent and problematic weeds to farmers and allergy sufferers in North America.
- The study aims to identify, review, and assess the scholarly literature on *Ambrosia trifida* for the period of 1900-2012 using a bibliometric analysis approach.

Introduction

- Ambrosia trifida*, a native species of North America, is rapidly spreading beyond its native riparian habitats into previously non-infested areas and has developed into a persistent and costly weed for farmers in the Corn Belt. Current approaches to manage the spread and dispersal of *Ambrosia trifida* are poorly diversified and herbicide resistant populations have increased dramatically in the last ten years [1].
- The literature on *Ambrosia trifida* is widely distributed with research published in a large number of scholarly outlets from authors all over the world. Few attempts have been made to date at identifying, gathering, and assessing systematic data on the global scientific production of *Ambrosia trifida* research.
- This study employs a summary-level bibliometric approach to describe and characterize the published scholarly literature on *Ambrosia trifida* and to reveal underlying pattern and trends of scholarly production from 1900 to 2012.
- Bibliometrics is a subcategory of scientometrics and focuses primarily on the quantitative study of scientific publications for statistical purposes. Conventional bibliometric methods focus on citation and content analysis, evaluation of scholarly outputs of authors, institutions, and countries, and identification of research patterns over time and have been widely applied in the science and engineering fields to study and evaluate the evolution of scientific production and research trends [2].

Materials and data

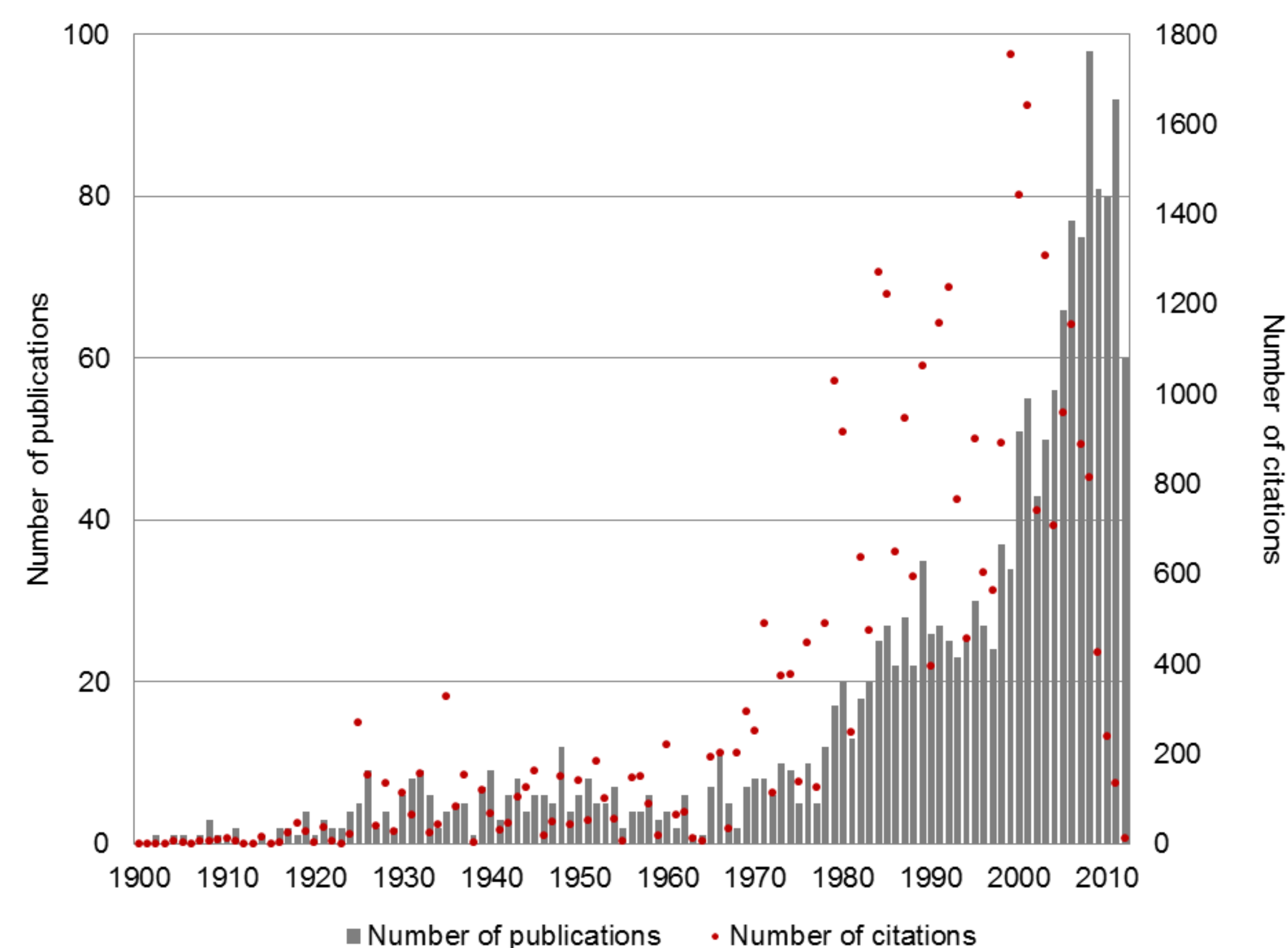
- Searches were carried out in multiple electronic databases and full-text repositories of broad and subject-specific nature to identify relevant publications. The search string used was "ambrosia trifida" OR "giant ragweed" OR "great ragweed". Search results were manually verified in order to ensure that the search term match indicated a relevant article and not a citation. Each article was then uniquely identified in the Web of Science (WoS) database to retrieve the complete publication data and to facilitate further bibliometric analysis.
- WoS was selected as the data source due to its broad coverage of the scientific literature, the quality of its metadata indexing, and the ability to perform citation analyses.
- All identified publications were assessed by the following criteria: publication outputs, subject categories, source titles, global productivity and collaboration, geographic distribution of authors, author keywords, and citation impact.

Summary of bibliometric indicators

Indicator	Value
Number of publications	1,749
Number of citations	35,933
Average citations per paper	20.5
H-index	84

Publication output

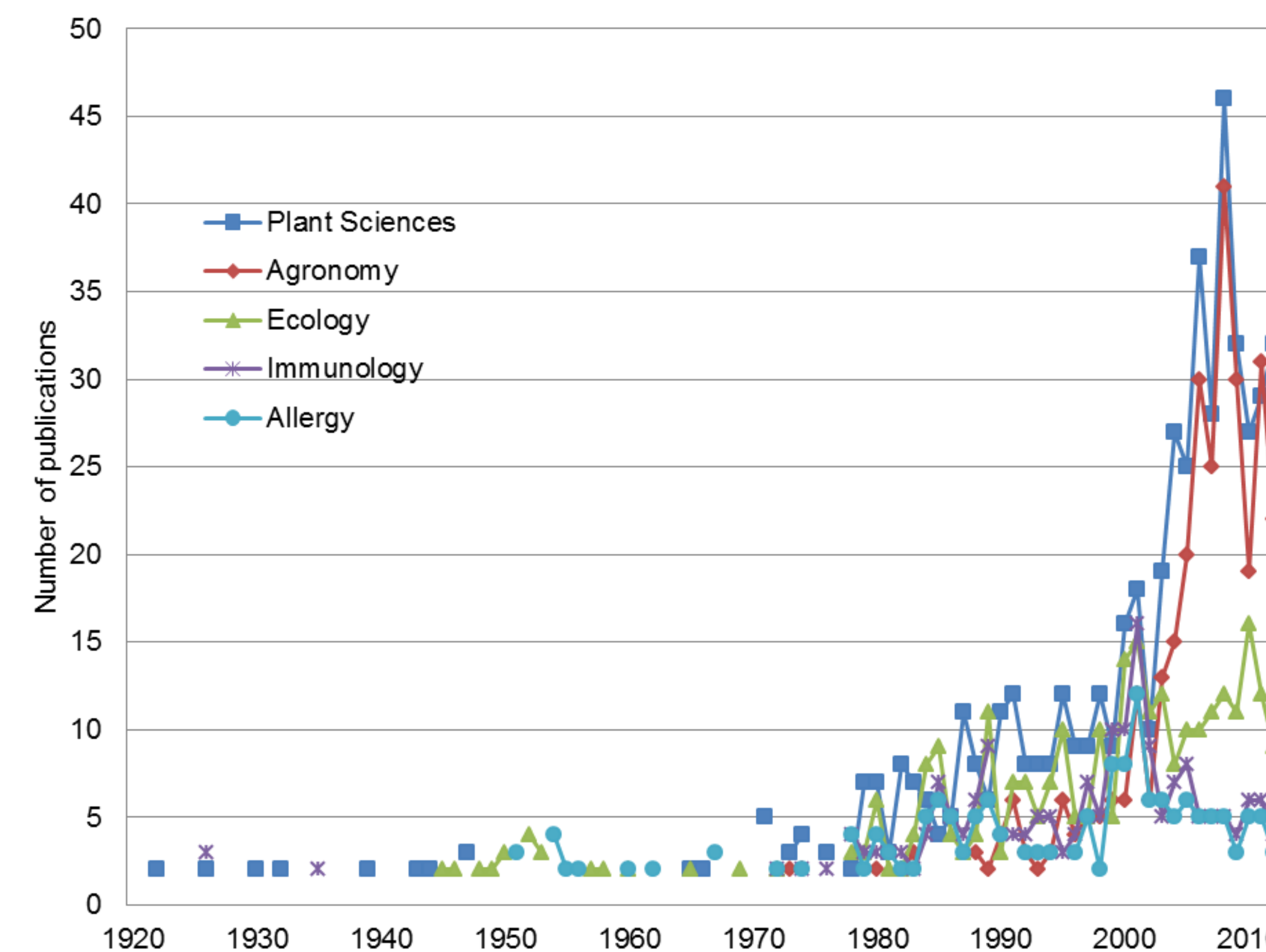
Publication and citation distribution by year



Subject categories and source titles

- The total number of articles related to *Ambrosia trifida* in the Web of Science database was 1,735, comprising mostly of original research articles (85.4%) and reviews (7.1%). Overall publication output and citation rates increased significantly over the study period.
- Publication dates ranged from 1903 to 2012 with a median publication date of 2000. Articles were cited 20.5 times on average, ranging from 0 to 498 citations; 15% of articles were uncited.
- Scientific production was fairly steady until the early 1980s averaging around 10 papers per year. Since then, publication and citation frequencies increased significantly, driven in particular by the increase of global publication output in the plant sciences and agronomy categories.
- Publications were distributed within 173 different subject categories indicating a large diversity of the literature on *Ambrosia trifida* overall. Plant Sciences was the most frequent subject category followed by Agronomy and Ecology where more than 70% of all papers were published. Ecology, Immunology, and Allergy experienced the highest citations rates of all subject categories.

Subject category (top 5) distribution by year



- There were more than 1,000 different source titles publishing articles related to *Ambrosia trifida* research showing a significant increase in the number of journal titles over time.
- The ten leading journals by publication count published about 30% of the total publications on *Ambrosia trifida*. *Weed Science* and *Weed Technology* were the top journals by publication count while articles published in *Ecology* and *Oecologia* were most cited on average.

Source title distribution (top 10)

Journal title	TP (%)	TC	CPP	IF	SC
1 Weed Science	108 (6.2)	2,016	18.7	1.696	Agronomy, Plant Sciences
2 Weed Technology	92 (5.3)	920	10.0	1.129	Agronomy, Plant Sciences
3 Journal of Allergy and Clinical Immunology	73 (4.2)	1,931	26.5	9.712	Allergy, Immunology
4 American Journal of Botany	48 (2.7)	1,384	28.8	3.159	Plant Sciences
5 Ecology	45 (2.6)	2,566	57.0	6.007	Ecology
6 Journal of Immunology	34 (1.9)	1,148	33.8	5.859	Immunology
7 Castanea	32 (1.8)	84	2.6	0.457	Plant Sciences
8 Journal of Economic Entomology	30 (1.7)	206	6.9	1.709	Entomology
9 Oecologia	28 (1.6)	1,420	50.7	3.888	Ecology
10 Journal of Allergy	27 (1.0)	311	11.5	9.712	Allergy, Immunology

TP=total publications, TC=total citations, CPP=citations per paper, IF=5-year impact factor, SC=subject category.

Most productive countries and institutions

- Authors contributing to *Ambrosia trifida* research were situated in more than 60 countries representing hundreds of different organizations. However, more than 65% of all publications were authored or co-authored by a scientist located in the U.S. or Canada.
- The most productive institutions by publication count and citation impact were all located in North America. The University of Illinois and USDA were the two most prolific organizations.

Country distribution (top 10)

Country	TP (%)
1 USA	1,015 (58.0)
2 Canada	135 (7.7)
3 China	60 (3.4)
4 Japan	56 (3.2)
5 England	53 (3.0)
6 Australia	29 (1.7)
7 Germany	28 (1.6)
8 Italy	28 (1.6)
9 Spain	27 (1.5)
10 Brazil	23 (1.3)

TP=total publications, CPP=citations per paper.

Institution distribution (top 10)

Institution	TP (%)	CPP
1 University of Illinois	78 (4.5)	36.0
2 USDA	76 (4.3)	17.7
3 Iowa State University	54 (3.1)	15.2
4 Purdue University	47 (2.7)	7.6
5 University of Wisconsin	42 (2.4)	17.7
6 The Ohio State University	39 (2.2)	15.0
7 University of California	34 (1.9)	29.2
8 University of Guelph	33 (1.9)	14.9
9 University of Nebraska	32 (1.8)	11.6
10 University of Minnesota	10 (1.5)	40.8

Citation and network analysis

- Citation rates and patterns indicate the recognition of works in the scientific community.
- The most cited articles related to *Ambrosia trifida* research were in the Ecology category.

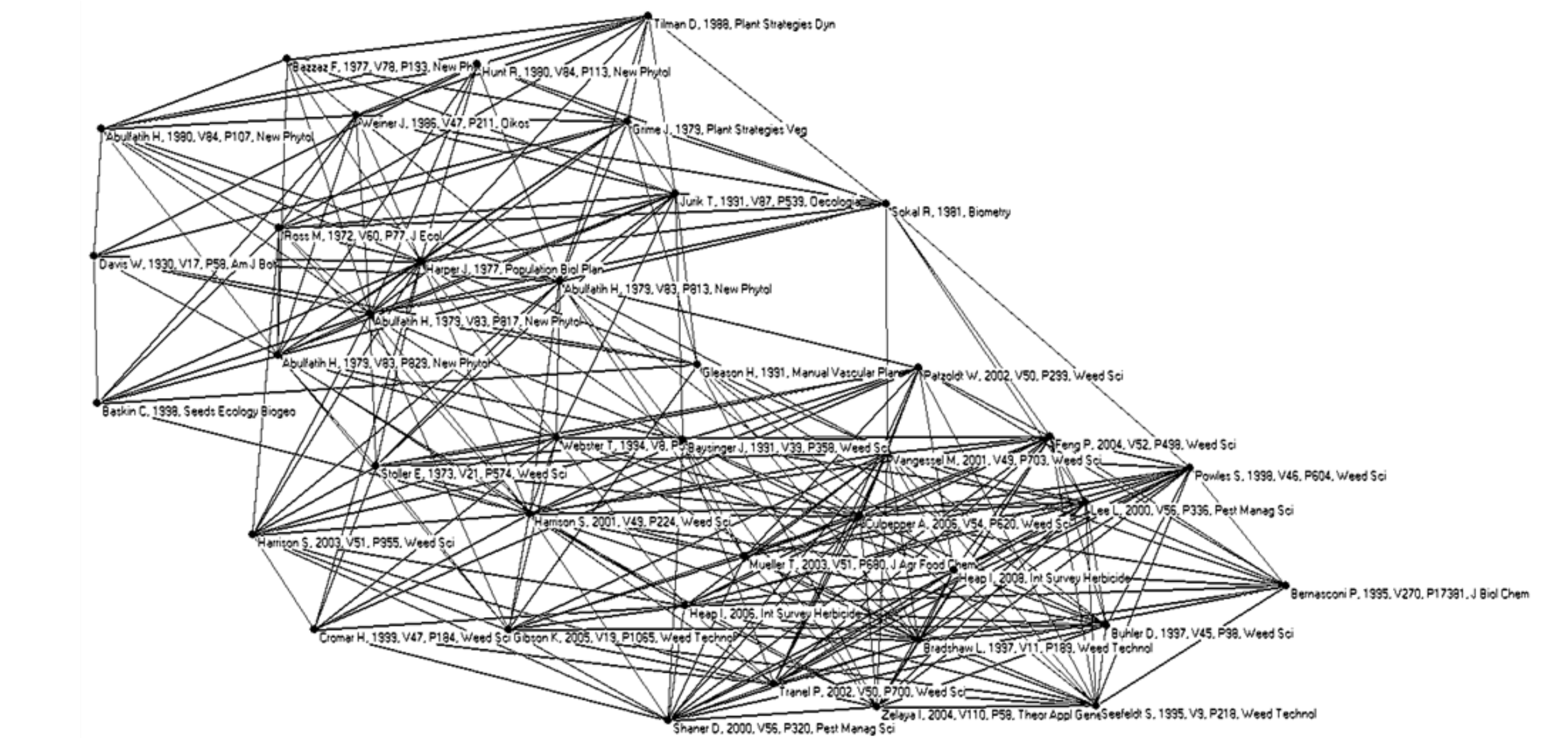
Most cited articles (top 5)

Title	Author	TC	Ref
1 Morphogenetic constraints on patterns of carbon distribution in plants	Watson & Casper	498	[3]
2 Allocating resources to reproduction and defense	Bazzaz et al.	425	[4]
3 Generation of reduced nicotinamide adenine dinucleotide for nitrate reduction in green leaves	Klepper et al.	326	[5]
4 Sexual selection in plants	Wilson	293	[6]
5 Impacts of root competition in forests and woodlands: A theoretical framework and review of experiments	Coomes & Grubb	256	[7]

TC=times cited, Ref=Reference

- Co-citation and co-occurrence analyses of words are relational bibliometric indicators and were used in this study to further analyze the changes in research activity and trends over time. These types of analysis also support monitoring and identifying emerging research topics and relevant contributors related to *Ambrosia trifida* research [2].

Co-citation network of the most cited references



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