

# Analysis and Visualisation of Research Trends in Alternaria Rot: A General Review

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## Abstract

*Alternaria rot disease is a fungal infection affecting plants and trees. The bibliometric analysis had been conducted to understand the active authors, organizations, journals, and countries involved in the research domain of “Alternaria rot”. All published articles related to “Alternaria rot” from “Scopus”, were analyzed using the VOS viewer to develop analysis tables and visualization maps. This article had set the objective to consolidate the scientific literature regarding the “Alternaria rot” and also to find out the trends related to the same. The most active journals in this research domain were identified as Plant Disease, Plant Journal, and Postharvest Biology and Technology. The most active countries were the United States of America and Portugal. The leading organizations engaged in the research regarding Alternaria rot were the Agricultural Research Organization of Israel and USDA Agricultural Research Service of the United States of America. The most active authors who had made valuable contributions related to Alternaria rot disease were Wang Y. and Akimitsu K.*

**Keywords:** *Alternaria rot, Bibliometric analysis, VOS viewer, Plant disease*

## 1. Introduction

Alternaria rot disease is a fungal disease caused by “*Alternaria alternata*”<sup>1-4</sup>. The initial symptoms of this plant disease include the appearance of lesions on the fruit surface. The lesions may be small and dark, in the advanced stage, the lesions develop and enter the flesh<sup>1</sup>. The ideal conditions for this pathogen are hot and humid conditions, where fruits have been stored for a long time and injured fruits<sup>1</sup>. Poor harvesting, storage, and handling are the main cause of the Alternaria rot. The measures for handling this disease include scientific harvesting, handling, storage, storage temperature, minimizing injuries, and transporting<sup>1, 4</sup>. Alternaria rot is considered as a post-harvest disease<sup>1-3</sup> and different elicitors like salicylic acid (SA), oxalic acid, calcium chloride, and antagonistic yeast *Cryptococcus laurentii* were found effective in enhancing defense mechanism against Alternaria rot, especially salicylic acid was found more effective<sup>2</sup>. Application of post-harvest spray is only partially effective in handling this disease<sup>3</sup>.

### 1.1 Research Objectives

- a) To consolidate the literature regarding the Alternaria rot

- b) To find out the trends related to research in the Alternaria rot

The following research questions are framed for conducting bibliometric analysis systematically.

### 1.2 Research Questions

- a) Who are the active researchers working on the Alternaria rot?
- b) Which are the main organizations and countries working on Alternaria rot?
- c) Which are the main journals related to Alternaria rot?

### 1.3 Significance of this research

Alternaria rot is a serious plant disease having both ecological and economic effects. This article points out the need for future research regarding the plant disease, Alternaria rot. This bibliometric analysis will be a useful platform for future researchers by realizing the top researchers, organizations, and countries involved in managing Alternaria rot disease. This bibliometric article is arranged in four sections. The first section is the introduction, followed by the discussion of the methodology by which the research was conducted. The third section deals with results and discussion. The fourth section deals with the conclusion.

## 2. Research Methodology

This bibliometric analysis had drawn resources only from the Scopus, which is having coverage of more than 69million records. For the article selection, the Boolean used was TITLE-ABS (“Alternaria rot”) on 27/12/2020. All the tables in this paper were created by using Microsoft Excel and VOS Viewer. Grammarly was used for spelling and grammar checks. Mendeley was used for article review and citation. This paper had been inspired by bibliometric analysis in its presentation style, analysis, and methodology from the works.<sup>5-9</sup>

## 3. Results and discussion

### 3.1 Results

This first round of search produced an outcome of 664 documents, in ten languages, out of which 630 documents were in English. The classification of document categories is shown in Figure 1. For improving the quality of the analysis, we had selected only the peer-reviewed articles and all other documents had not been considered. Thus after using filters “Article” and “English” the second round search produced an outcome of 532 English articles (both open access and others) and had been used to conduct bibliometric analysis and visualization using VOS Viewer. The English research articles in this domain since 1956 had been shown in Figure 2.

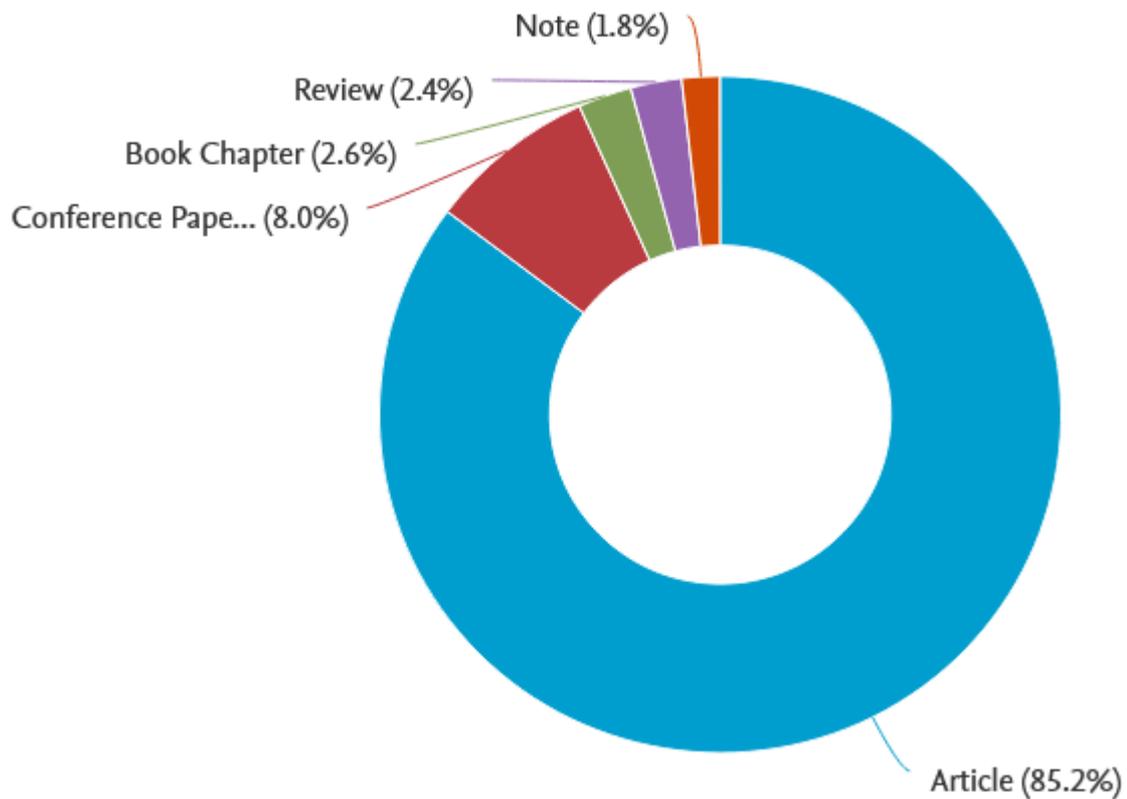


Figure 1: Classification of the documents on “Alternaria rot”, Source: www.scopus.com

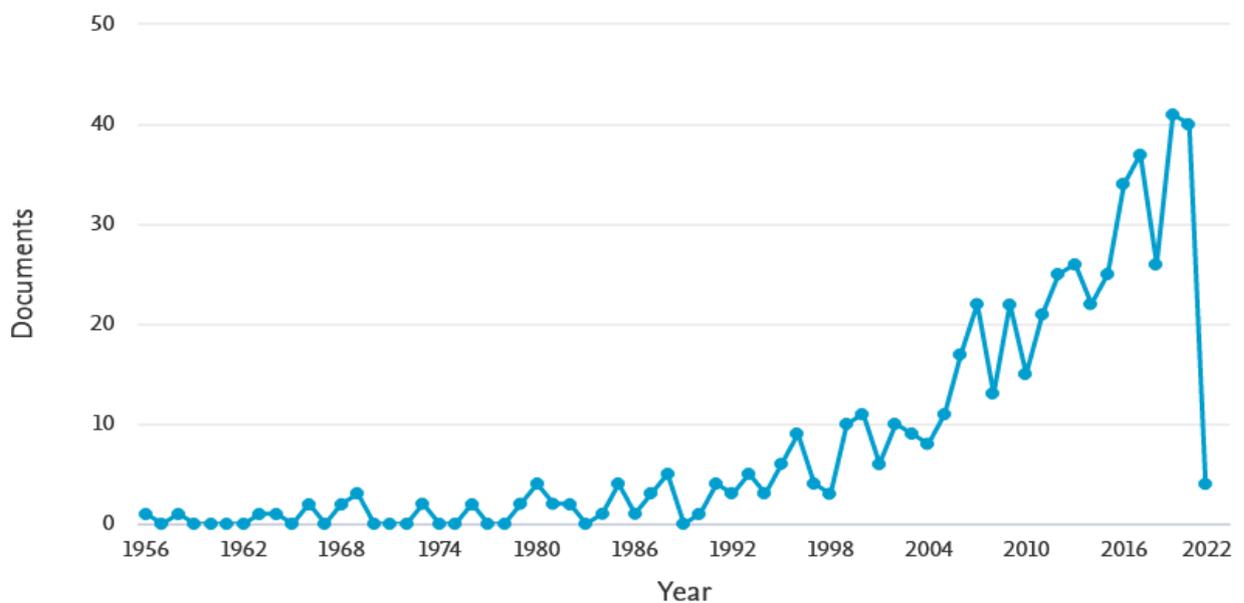


Figure 2: Period wise publication of articles, Source: WWW.scopus.com

Co-authorship analysis of top authors had been shown in figure 3. For a better presentation of the analysis, the parameters used were the minimum number of documents of an author as four and the minimum number of citations of authors as one. This combination plotted the

map of 37 authors, in 14 clusters. The overlay visualization map of co-authorship analysis plotted in Figure 3, points out the major researchers with their strong co-authorship linkages and clusters involved.

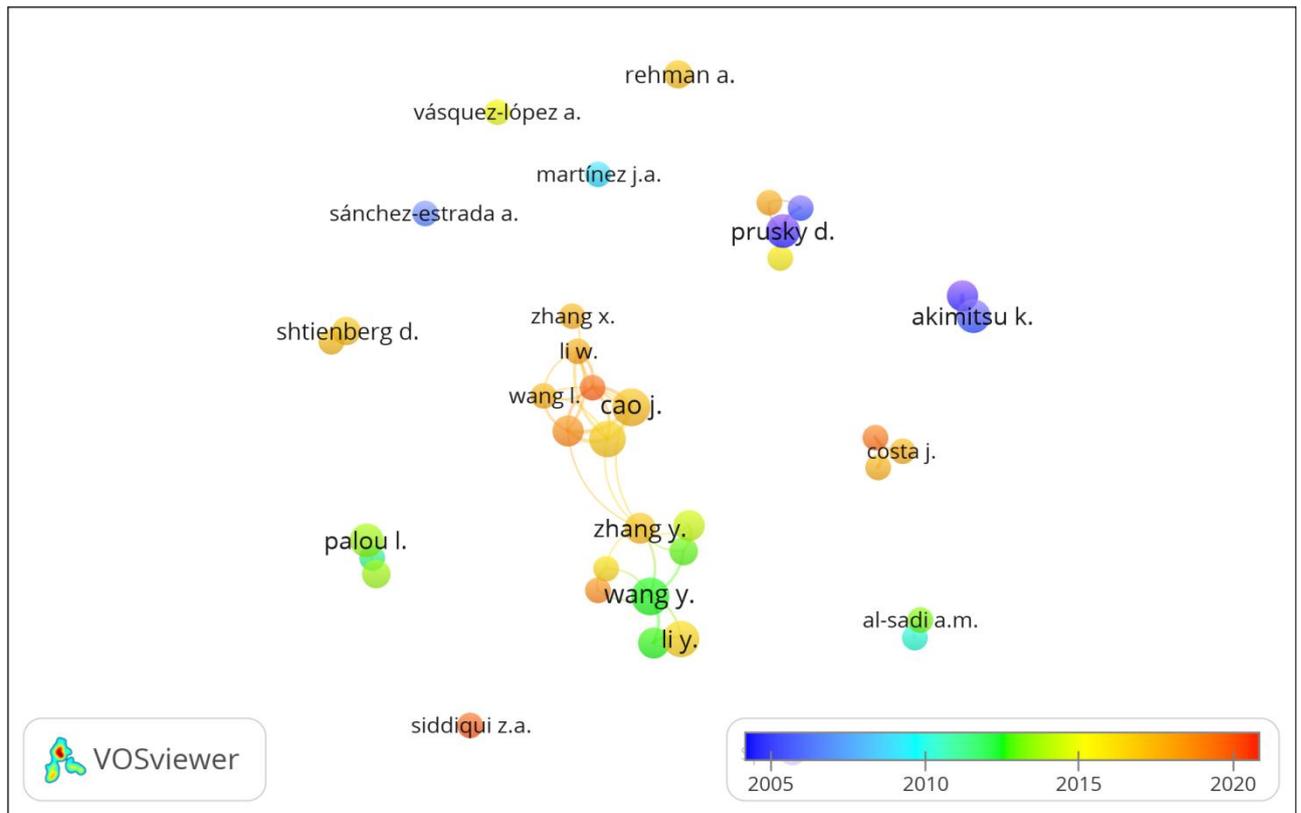


Figure 3: Co-authorship analysis on basis of authors

The citation analysis of top authors had been shown in table 1, along with co-authorship links. For the citation analysis, the parameters used were the minimum number of documents of an author as one and the minimum citations of an author as one.

Table 1: Highlights of most active authors

Description	Authors	Documents	Citations	Average citations per documents	Link strength
Authors with the highest publication and co-authorship links	Wang Y.	9	206	22.89	49
Authors with the highest citation	Akimitsu K.	7	289	41.29	36
Authors with the highest average citation	Brader G.	1	146	146	3
	Halkier B.A.	1	146	146	3
	Mikkelsen M.D.	1	146	146	3
	Tapio Palva E.	1	146	146	3



visualization map of co-authorship analysis plotted in Figure 5, points out the main countries with their strong co-authorship linkages and clusters involved.

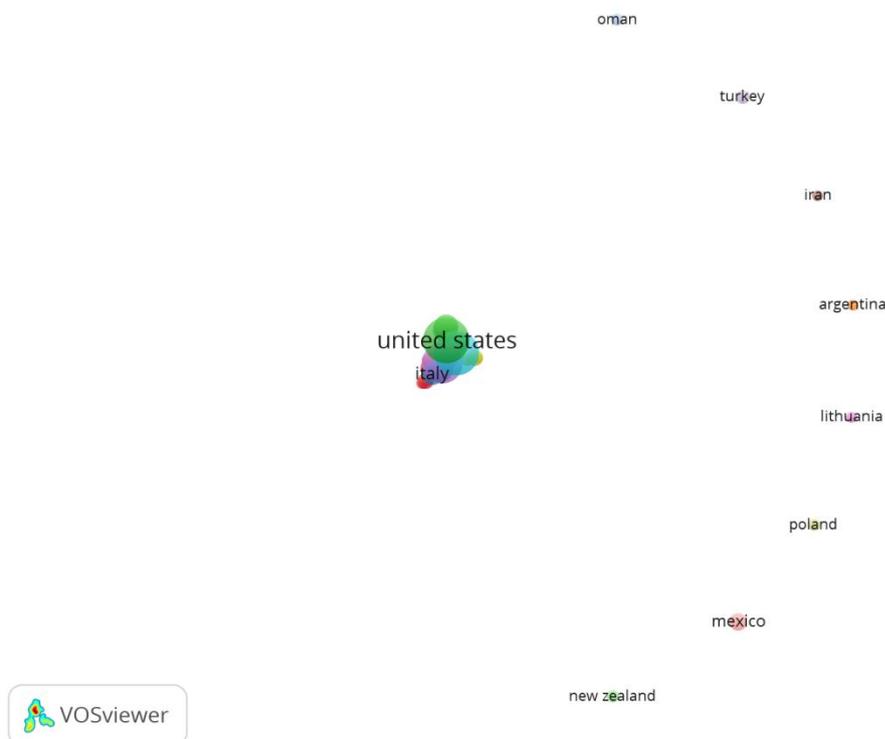


Figure 5: Co-authorship analysis on basis of countries

The citation analysis of top countries had been shown in table 3, along with co-authorship links. For the citation analysis, the parameters used were the minimum number of documents of a country as one and the minimum citations of the country as one.

Table 3: Highlights of Active Countries

Description	Country	Documents	Citations	Average citations per documents	Link strength
The country with the highest publication, citation, and co-authorship links	United States	81	1937	23.91	29
The country with the average citation	Portugal	1	121	121	0

The most active country in this research domain was the United States of America with the highest number of publications, citations, and co-authorship links. Portugal was the country with the highest average citation.

Link analysis and citation analysis were used to identify the most active journal in this research domain. We have taken the parameters of the minimum number of documents of a journal as

one and the minimum number of citations of a journal as one for the link analysis and citation analysis. Highlights of the most active and relevant journals related to the “*Alternaria rot*” are shown in table 4. Table 4 shows the journal activity of this research domain through parameters of publication volume, citations, and co-authorship linkages. Plant Disease was the most active journal with the highest publications and co-authorship links and Postharvest Biology and Technology is the journal with the highest citations and Plant journal had the highest average citations.

Table 4: Analysis of journal activity

Description	Journal details	Documents	Citations	Average citations per documents	Link strength
Journal with the highest publications and co-authorship links	Plant Disease	36	552	15.33	47
Journal with the highest average citation	Plant Journal	1	146	146	0
Journal with the highest citations	Postharvest Biology and Technology	26	642	24.69	38

From the above discussion regarding the bibliometric patterns in the research regarding the *Alternaria rot*, this research had observed a gradual increase in research interest regarding the *Alternaria rot* from the starting of the millennium and the momentum is going on positively. This points out the relevance and potential of this research domain (Refer to Figure 2). The most active author in this research domain is Wang Y. and Akimitsu K. with the highest publication, citations, and co-authorship links. The highlights of authors with the highest average citation as shown in table 1 (Refer to table 1). The overlay analysis of top countries researching *Alternaria rot* indicates that the United States of America was the leading country in research regarding *Alternaria rot* disease with the highest publications, citations, and co-authorship links. Portugal is having the highest number of average citations (Refer to figure 5). The top journals of this research domain were identified as Plant Disease and Plant Journal and Postharvest Biology and Technology. From these wide sources of information, researchers can focus on top journals where they can identify the most relevant and highly cited articles regarding *Alternaria rot*.

#### 4. Conclusion

*Alternaria rot* is an interesting research domain and the most active journals related to this plant disease are Plant Disease, Plant Journal, and Postharvest Biology and Technology. The most active countries was the United States of America and Portugal. The leading organizations engaged in the research regarding *Alternaria rot* was the Agricultural Research Organization of Israel and the USDA Agricultural Research Service of the United States of America The most active authors who had made valuable contributions related to *Alternaria rot* disease were Wang Y. and Akimitsu K. This research domain offers a new avenue for researchers and the future research can be on disease control, developing chemical control measures, identifying new

biological control measures and development of resistant variants.

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