DOI: 10.53469/jcmp.2024.06(11).13

The Current Status and Trend Analysis of Mulberry Leaf and Diabetes Research on Citespace and Vosviewer

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Abstract: ***Objective:*** *To analyze the research status of mulberry leaf and diabetes, in order to provide reference for researchers in related fields.* ***Methods:*** *The literature related to mulberry leaf and diabetes from 2010 to 2022 in CNKI and WOS were searched, 314 Chinese literatures and 184 foreign literatures were included by Citespace and Vosviewer.* ***Result:*** *The result analysis found that there are fewer core authors and there is not close cooperation between research institutions. Mulberry leaf polysaccharide, medication patterns, hypoglycemic effects, active ingredients etc are high-frequency and high heart rate keywords in this field.* ***Conclusion:*** *The research is in the stage of continuous development, and we should strengthen the research, encourage cooperation between different research institutions, and Longitudinal study of mulberry leaf diabetes should also be deepened.*

Keywords: Mulberry leaf, Diabetes, Bibliometrics, CiteSpace, Vosviewer, Visual analysis.

1. Introduction

Mulberry leaves are known as the king of plants and are the dried leaves of Moraceae plants. Mulberry leaves are rich in flavonoids [2], alkaloids [3], polysaccharides [4] and other ingredients, which can reduce blood sugar [5], blood pressure [6], blood lipids [7], antioxidation [8], anti-inflammation [9] and so on. It is a "homologous substance of medicine and food" confirmed by the Ministry of Health, and it is also one of the top ten health foods listed by the International Food Hygiene Organization in the 21st century.

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia without treatment intervention. Nowadays, diabetes has gradually become one of the major diseases that threaten human health.

The research and analysis of the publication of related literature is of great significance for the study of this subject. In order to understand the research status, hot direction and development trend in the subject field of mulberry leaves and diabetes, this study visually analyzed the publication trend, institutional sources and key words of the included literature by searching the paper database and using citespace and Vosviewer, and summarized the basic research status and trend of mulberry leaves and diabetes at home and abroad. To provide reference and basis for researchers and related institutions engaged in the research of mulberry leaves and diabetes.

2. Data and Methods

2.1 Data Sources

Chinese academic literatures were searched through China knowledge Network (https://www.cnki.net/). In the advanced search box, a total of 330 articles on mulberry leaves and diabetes were searched with "subject (accurate)" as the search condition and "mulberry leaf" AND "diabetes" as the key form. Foreign academic literatures were searched by Web of Science Core Collection (https://access.clarivate.com/). In the advanced search box, all articles on mulberry leaves and diabetes from January 1, 2010 to May 15, 2024 were searched with "TS=Mulberry leaves" And "TS=diabetes".

2.2 Data Inclusion and Exclusion Criteria

The included articles were excluded from conferences, industry guides and repeated publications. 248 articles were searched in CNKI and 202 articles were searched in Web of Science.

2.3 Research Methods

Visual analysis of Chinese and English literature in specific fields.

In this study, CiteSpace and Vosviewer software are used to visually analyze the knowledge graph of the documents obtained by China knowledge Network (CNKI) and WOS (web of science), and Excel and other software are used to analyze the literature data and results. From the visual maps such as co-occurrence network, clustering network and keyword emergence, this paper studies and analyzes the general situation of the research related to mulberry leaves and diabetes, in order to provide direction and guidance for further research in this field.

3. Result Analysis

3.1 Analysis of WOS Search Results

3.1.1 Trend in the number of articles published

Since 2010, the number of literatures on mulberry leaves and diabetes retrieved from the WoS database is shown in figure 1. The overall upward trend is that the number of articles published is less before 2014, and the development is in the early stage; after 2014, the development continues to rise. In 2022, the highest annual number of articles was 31.

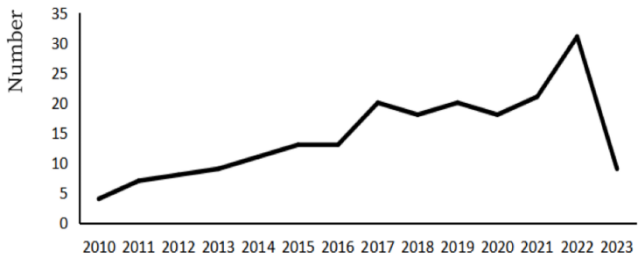

Figure 1: Search results of the number of documents published in WoS database

3.1.2 Analysis of the place where the article was published

From 2010 to 2023, the literature retrieved from WoS shows that the countries with published volume ≥ 10 are shown in Table 1. It can be clearly seen from the picture that China has the highest volume of articles, followed by South Korea, India, Japan, the United States and Thailand; different countries / regions have different scientific and technological investment in mulberry leaves and diabetes research, although some countries / regions are suitable for planting mulberry leaves, but the investment in scientific research is limited.

Table 1: Search results of countries with published articles ≥ 10 in WoS database

Country/region	The number of articles published (articles)
CHINA	88
SOUTH KOREA	25
INDIA	18
JAPAN	13
USA	12
THAILAND	10

3.1.3 Analysis of the publication sources of articles

The volume of articles on mulberry leaves and diabetes since 2010 is found in the WoS search results (Table 2). The high volume of publications on mulberry leaves and diabetes are mainly from the UK (4). Among them, the title with the highest volume of publication is "JOURNAL OFETHNOPHARMACOLOGY", published in Ireland, with 11 articles, impact factor 5.195, followed by "EVIDENCE BASED COMPLEMENTARY AND ALTERNATIVEMEDICINE", published in the United Kingdom, 7 articles, impact factor 2.65 and so on. The number of articles published in each publication is different, and the influencing factors show different states, that is, there is no rule between the number of papers published and the influencing factors.

Table 2: The retrieval results of publications, periodicals and publishing places with a volume of documents ≥ 6 in WoS database.

Publication title	Country	The number of articles published (articles)	Periodical influence factor
JOURNAL OF ETHNOPHARMACOLOGY	Ireland	11	5.195
EVIDENCE BASED COMPLEMENTARY AND ALTERNATIVE MEDICINE	The United Kingdom	7	2.65
JOURNAL OF FUNCTIONAL FOODS	Netherlands	7	5.223
PHYTOTHERAPY RESEARCH	The United Kingdom	7	6.388
FOOD FUNCTION	The United Kingdom	6	6.317
MOLECULES	Switzerland	6	4.927
NUTRIENTS	Switzerland	6	5.988

3.1.4 keyword analysis

The keyword is the focus of the article, and its frequency reflects the hot spot and trend of research in this field to some extent. With the help of Vosviewer, the keyword co-occurrence analysis of 202articles searched by WoS (figure 2) shows that the higher the occurrence frequency is, the larger the node is. Such as "agent (pharmacology)", "therapy (treatment)", "basis (basic/raw material)", "ingredient (raw material/ingredient)", "proliferator (proliferation)", "tea", "muscle (influence)", "manner (species)" and so on appear frequently, it can be explained as the research hotspot in this field.

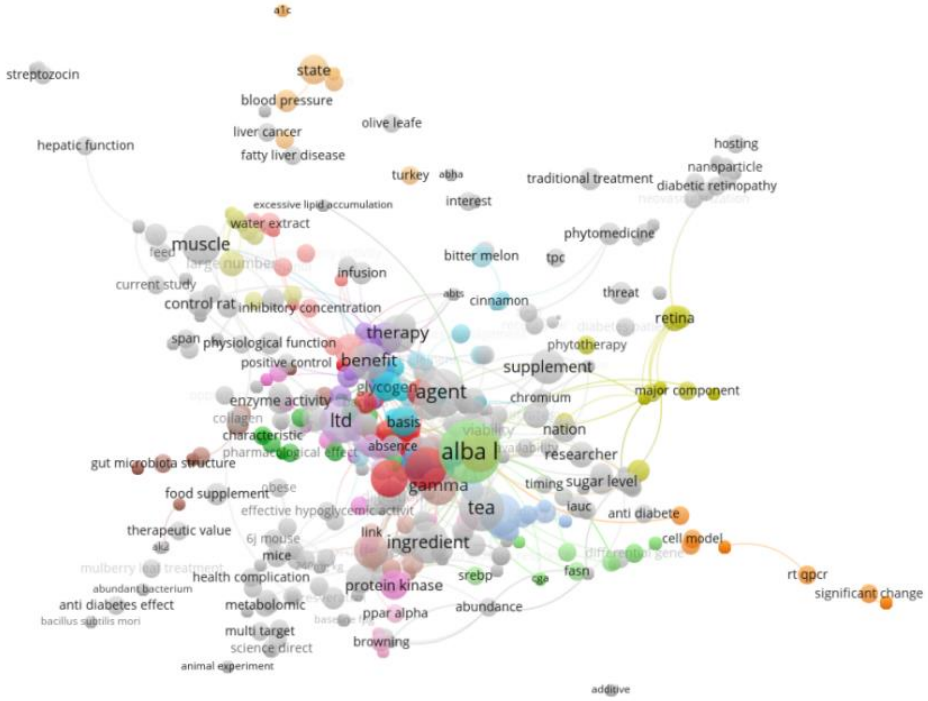

Figure 2: Key words co-occurrence results of literature retrieved by WoS database

From 2010 to now, the literatures searched on WoS have been clustered and analyzed by Citespace. The time is set from January 2010 to May 2023, once a year for analysis. NodeType is keyword, and clustering tag is LLR algorithm. As shown in figure 3, a total of 12 clustering plates are formed with a Q value of 0.6843. The clustering results are convincing and some clusters overlap with each other, indicating that there are similarities between different clusters. The research topics under each clustering tag are summarized, as shown in Table 3.

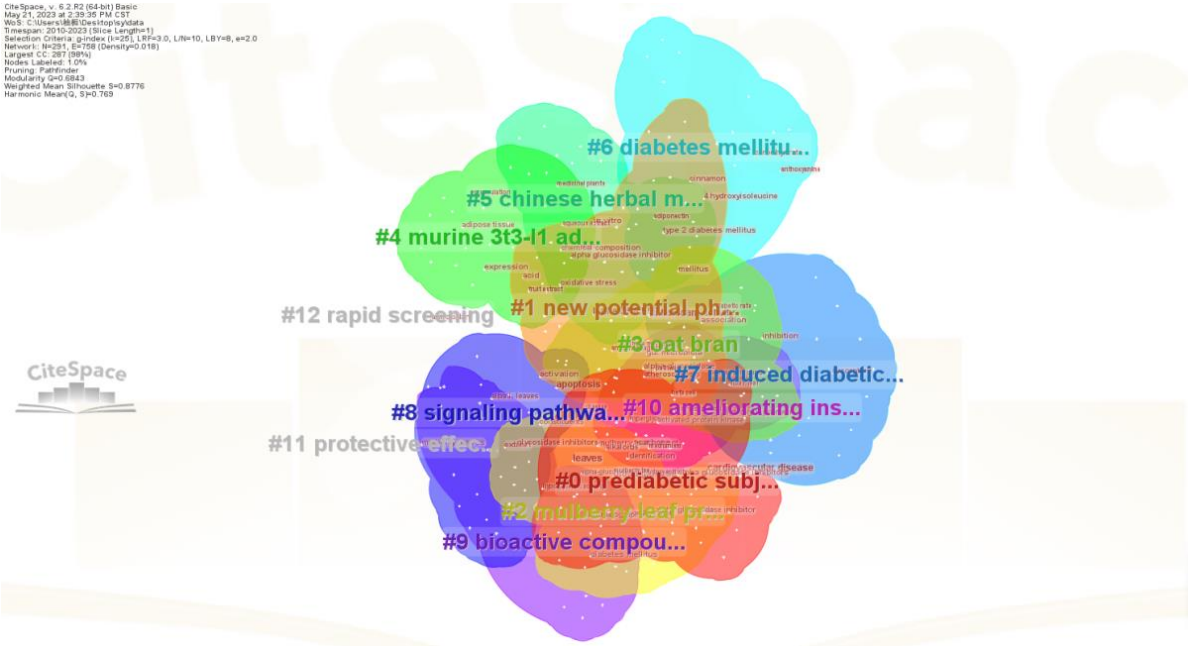

Figure 3: Keyword clustering of retrieved documents in WoS database

Table 4: Keyword clustering results of retrieved documents inWoS database

ID	Number of nodes	Contour value (S)	Year of generation	LLR	Research topic
#11	9	0.95	2012	protective effect	Study on Mulberry Leaf Diabetes Mellitus
#2	29	0.932	2014	Mulberry leaf product	Effect of functional products of Mulberry leaves on Diabetes
#12	8	0.933	2014	rapid screening	Optimization of Mulberry Leaf process
#0	37	0.888	2015	prediabetic subject	
#4	25	0.902	2015	Murine 3t3-l1 adipocyte	
#8	21	0.818	2015	signaling pathway	Study on the Mechanism of Mulberry leaves on Diabetic mice
#10	15	0.945	2015	ameliorating insulin	
#5	25	0.838	2016	Chinese herbal medicine	
#6	25	0.946	2016	Diabetes mellitus	Effect of Mulberry Leaf extract on Blood glucose
#9	15	0.87	2016	bioactive compound	
#3	26	0.808	2017	Oat bran	Study on the effect of mulberry leaf extract on diabetic rats
#7	22	0.77	2017	Induced diabetic rat	
#1	30	0.883	2018	New potential phytotherapeutics	Hypoglycemic effect of mulberry leaves combined with other substances

3.1.5 Analysis of research institutions

Table 3: Search results of institutions with more than 5 published articles in WoS database

Organization	country	The number of articles sent
Nanjing University of traditional Chinese Medicine	China	10
Jiangsu University	China	8
Beijing University of traditional Chinese Medicine	China	8
Northeastern University	Japan	7
EKB	Egypt	6
Xuzhou University of traditional Chinese Medicine	China	6

Research institutions published on mulberry leaves and diabetes (≥ 5) were found on WoS, as shown in Table 3. The institutions with the highest volume of articles are mainly in China, among which Nanjing University of traditional Chinese Medicine is the institution with the highest number of Chinese mainland posts, that is, institutions that pay more attention to mulberry leaves and diabetes. According to the analysis of centrality, time and other influencing factors, the recent foreign research institutions on mulberry leaves and diabetes are Tohoku University of Japan and Egyptian knowledge base EKB.

3.2 Analysis of CNKI Search Results

3.2.1 Analysis of the number of articles published

Figure 4: Search results of the number of posts in the CNKI library

3.2.2 Analysis of the main periodical sources of articles

There are 3 journals with more than 10 literatures on mulberry leaves and diabetes in CNKI database. Among them, Beijing University of traditional Chinese Medicine (13), Chinese Experimental prescription (12), Silk Science (11) ≥ 10, publishing institutions are concentrated in Beijing, Jiangsu and other economically developed areas.

3.2.3 Keyword analysis

Keywords with high frequency such as "sugar", "action mechanism" and "data mining" can indicate to a certain extent that in the subject research field of mulberry leaves and diabetes, the relationship between mulberry leaves and blood sugar and its hypoglycemic mechanism have a certain degree of research. The high frequency of key words such as "mulberry leaf polysaccharides", "mulberry leaf flavonoids" and so on indicates that the active components of mulberry leaves have certain research hotspots in the research field of mulberry leaves and diabetes. The high frequency of key words such as "mulberry leaf tea", "mulberry tree", "mulberry branch" and "mulberry white bark" indicates that mulberry leaves and their functional products are also hot spots in the research of mulberry leaves and diabetes to some extent. The high frequency of keywords such as "extraction technology" and "extract" to a certain extent indicates that the extraction of functional components and nutrients from mulberry leaves is also one of the hotspots in the subject research field of mulberry leaves and diabetes.

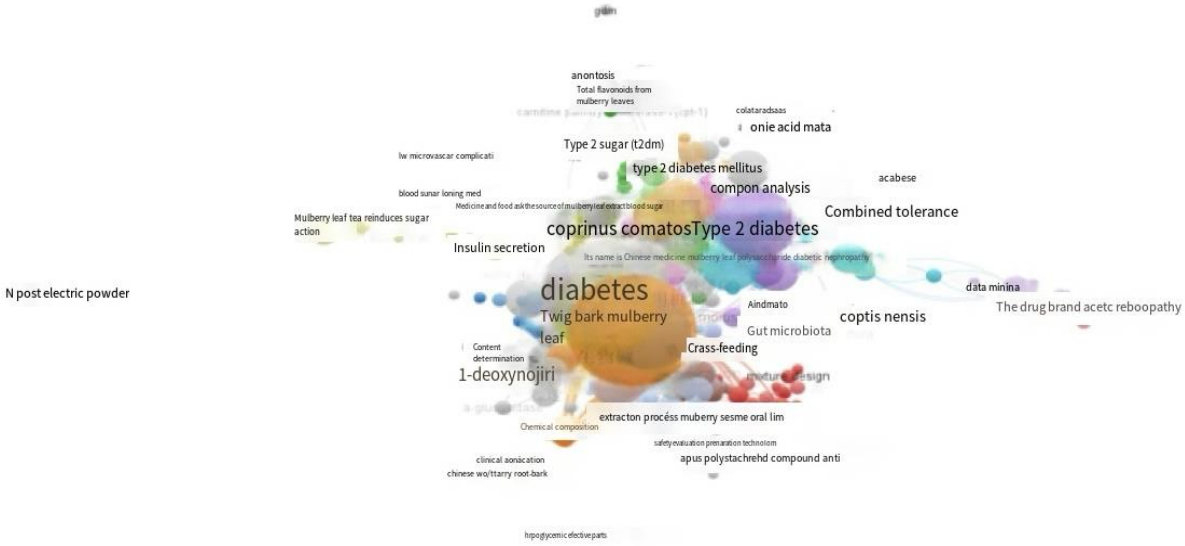

Figure 5: Results of co-occurrence of keywords in CNKI search documents

With the help of CiteSpace software, the keywords of 48 Chinese literatures searched in CNKI are analyzed by cluster analysis, and the results are shown in figure 7. Clustering module value (Q value = 0.6452) & gt;0.3 means that the clustering structure is significant, clustering average profile value (S value = 0.8813) & gt;0.7 indicates good internal homogeneity of clustering, and the clustering result is convincing [11]. A total of 12 modules, the smaller the sequence of modules, the more nodes it contains, the more research content and the wider the scope of research. Among them, those related to # 0 mulberry leaf polysaccharides, # 2 blood sugar, # 3 insulin resistance, # 4 hypoglycemic and # 8 mulberry leaf tea have always been hot spots in the research field of mulberry leaves and diabetes.

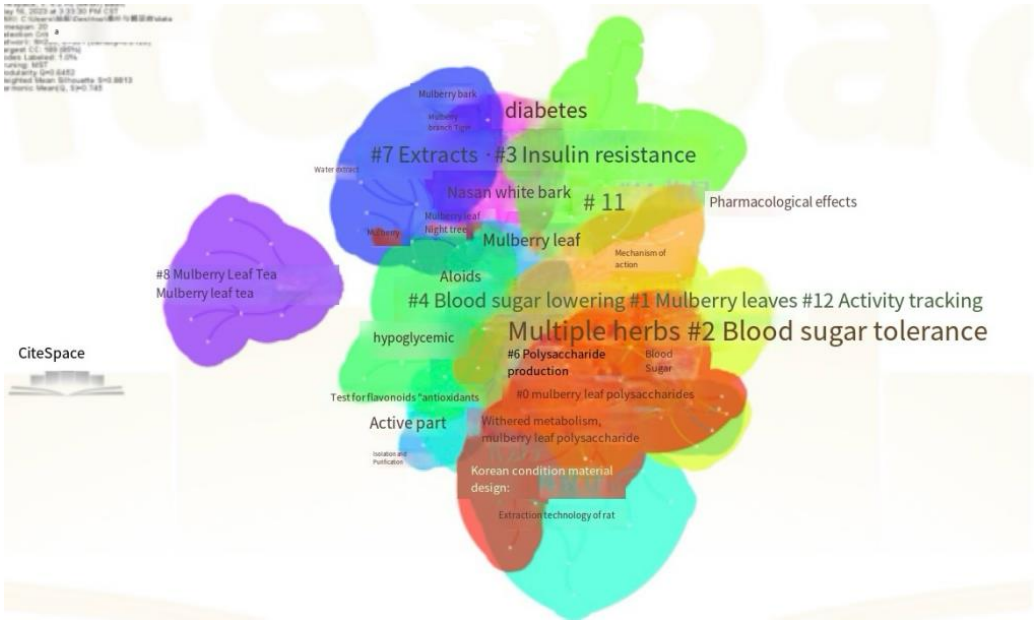

Figure 7: Clustering results of keywords in documents retrieved in CNKI database

3.2.4 Analysis of Research institutions for articles

In the CNKI database, there are 9 institutions with relatively high volume of articles (≥ 9) with mulberry leaves and diabetes as the theme, as shown in Table 4. The research institutions focusing on mulberry leaves and diabetes are concentrated in Beijing, Zhejiang, Jiangsu, Guangdong and other provinces and cities. The research institution with the largest number of articles is Beijing University of traditional Chinese Medicine in Beijing, with an annual volume of 24 articles, followed by Zhejiang University in Zhejiang Province, Jiangsu University in Jiangsu Province and so on. To a certain extent, this shows that the local scientific research strength and geographical environment are different, and the research efforts on mulberry leaves and diabetes are different.

Table 4: Research structure search results of ≥ 9 articles in CNKI database

Organization name	Area	The number of articles sent	Ranking
Beijing University of traditional Chinese Medicine	Beijing	24	1
Zhejiang University	Zhejiang	15	2
Nanjing University of traditional Chinese Medicine	Jiangsu	15	3
Southwest University	Chongqing	14	4
Shandong Agricultural University	Shandong	13	4
Jiangsu University	Jiangsu	12	5
Guangzhou University of traditional Chinese Medicine	Guangdong	9	6
Suzhou University	Jiangsu	9	7
Mudanjiang Medical College	Heilongjiang	9	7

3.2.5 Analysis of the author

The results are sorted out with the help of Excel, and the results are shown in Table 5. As can be seen from the table, the same research institution forms a team, and its research direction is basically the same.

Table 5: List the authors whose number of 8CNKI posts ≥ 5

Author	Organization	Number of articles sent	Research direction
Liu Hongfeng	Mudanjiang Medical College	7	Relationship between active components of mulberry leaves and diabetes mellitus
Han Zhixue	Mudanjiang Medical College	6	Relationship between active components of mulberry leaves and diabetes mellitus
Wu Xinrong	Southern Theater General Hospital	5	Study on the hypoglycemic Mechanism of Mulberry leaves
Song Tiejun	Mudanjiang Medical College	6	Relationship between active components of mulberry leaves and diabetes mellitus
Pan Shijia	Qingdao University of Science and Technology	5	Study on the hypoglycemic Mechanism of Mulberry leaves

4. Discussion

4.1 Number of Posts

From the point of view of the volume of articles, the number of articles on mulberry leaves and diabetes is obviously increasing year by year, which indicates that the research on mulberry leaves and diabetes will be hot for a long time in the future.

4.2 Research Institutions and Core Teams

Of Chinese Medicine, Xuzhou Medical University (Xuzhou Medical University) with Tang Daoquan, Li Dingxiang and Ji Shuai as the core. Therefore, when seeking institutional cooperation, we can focus on these institutions with strong scientific research strength and large investment in scientific research. However, from the visual results, the cooperation between these institutions and institutions is less, the cooperation of most research institutions is only within the same region, and the joint cooperation between institutions and institutions in different regions is very little. The effectiveness of exchanges such as the differential cooperation between different regions and the goal-oriented cooperation of different universities and research institutions is an important factor to promote the development of mulberry leaf and diabetes research. Therefore, the next step of cooperation between agencies is also a key task.

4.3 Posting Area

From the point of view of the posting area: China ranks first in terms of the number of posts on mulberry leaves and diabetes, whether in the WoS database or in the CNKI database. This may be because China is not only the origin of mulberry, but also there are 16 mulberry varieties in the world, while there are about 11 species in the middle and lower reaches of the Yangtze River in China [12]. The most important thing is that China has invested considerable scientific energy in the thematic research on mulberry leaves and diabetes.

4.4 Research Topics

Tang Daoquan, Li Dingxiang and Ji Shuai focused on the intestinal flora and metabolism of mulberry leaf water extract on diabetic animal model. Therefore, researchers on the theme of mulberry leaves and glycosuria can focus on related studies to make the theme of mulberry leaves and diabetes more in-depth and comprehensive.

5. Conclusion

In this study, the related studies of mulberry leaves and diabetes were visually analyzed by bibliometrics with the help of Citespace, Vosviewer and Excel software. The results show that mulberry leaf polysaccharides, mulberry leaf tea, action mechanism and data mining are the mainstream research hotspots at present. It is predicted that the development of hypoglycemic functional products of mulberry leaves and the hypoglycemic mechanism of active components of mulberry leaves will be the mainstream hot spots in the future. With the development of time, the research has gone from the basic macro level to the specific micro level, but the development is slow. I hope that more researchers and research institutions will continue to strengthen the longitudinal research in the future. with a view to deeper and more detailed research on this topic in the future. At the same time, many core teams have been formed, but the cooperation between teams is poor. In the follow-up, the cooperation between teams should be

continuously strengthened to strengthen the core researchers in this field, with a view to enriching and maturing the related research on this topic in the future.

Fund Project

Supported by Shaanxi Key Laboratory of Research on TCM Physical Constitution and Diseases Prevention and Treatment, No.23JS008.

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