Pak. J. Bot., 58(8) August 2026.

ARTICLE DOI: http://dx.doi.org/10.30848/PJB2026-8(1)

EXPLORING THE PRODUCTION OF NATURALLY SELENIUM-ENRICHED CRISP PLUMS SERIES IN SUITABLE AREAS OF CHONGQING, CHINA

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Abstract

The Crisp plum series is popular in the southwest of China, especially in Chongqing, where not all areas are suitable for its growth. Selenium (Se), an essential trace element for human health, typically transfers from soil to food, making soil Se content a key consideration. Using MaxEnt and ArcGIS, we analyzed 186 planting sites and 19 bioclimatic variables and one altitude variable to model suitable growing areas. Results showed that moderate-suitable areas were the largest, covering approximately 4.93×10^4 km^2 (59.54% of the total region). High-suitable areas were limited to northeastern Chongqing, covering only 0.26×10^4 km^2 (3.21%). Key factors influencing the suitability of crisp plum series included seasonal temperature change, mean temperature of the wettest quarter, precipitation of the driest month, and precipitation of the driest quarter. Although Nanchuan District has the highest reported soil Se content in Chongqing, it primarily falls within the moderate-suitable class (mainly in the northwest), while low-suitable and unsuitable areas fall within the southeast. Se content in sampled fruits ranged from 3.8 to 9.1 μg/kg FW, below China's standard for naturally selenium-enriched fruits (10-500 μg/kg FW). This study provides critical insights for optimizing crisp plum cultivation and guiding future production of naturally selenium-containing fruits in Chongqing region.

Key words: Key factors; Bioclimate variables; MaxEnt model; Suitable area; Fruit quality

Introduction

Plum (*Prunus salicina* Lindl.) trees are known for their high adaptability and can thrive in a wide range of temperatures (Saikhantsetseg & Nini, 2013; Rana *et al*., 2017). Despite the decreasing trends in temperature in certain areas, the productivity of plum in Himachal Pradesh has not been affected (Rana *et al*., 2017). Among Asian countries, China has the largest plum cultivation area. In particular, Chongqing, with its favorable climatic conditions and abundant land resources, has witnessed a significant growth in plum cultivation over the years. The crisp plum series, including varieties like 'Qingcui' and 'Cuihong', are known for their crispy and sweet taste and are widely planted in Chongqing. According to the agricultural production statistics provided by the Agricultural Technology Extension Station of Chongqing, the planting area and yield of plum have been increasing year by year. As of 2024, the planting area of plum is 971.33 km^2 with a yield of 91.7×10^4 t and a comprehensive output value of 11.4 billion yuan. The industrial scale has jumped to the second place in China, and has become the second largest fruit industry in Chongqing. Major planting counties for plum include Wushan, Wuxi, Wanzhou, Kaizhou, Yubei, Nanchuan, Banan. The main cultivated varieties of crisp plum series are locally developed ones, such as 'Wushan Cui', 'Wuxi Wancui', 'Wanqing', 'Jincui', 'Cuihong'. In terms of early, mid, and late-maturing varieties, the ratio is approximately 18:52:30 (Kou *et al*., 2019). The main cultivated varieties of the crisp plum series are locally developed ones such as 'Wushan', 'Wuxi wancui', 'Wanqing', 'Jincui', and 'Cuihong'. Well-known brands in Chongqing include 'Wushan', 'Waizui', and 'Jincui'. Plum cultivation has become an important pillar industry in the rural economy of the Chongqing region, helping to uplift impoverished households out of poverty.

Chongqing has a subtropical monsoon humid climate with different climatic conditions, slopes, and heights. It is located between 28° 10'-32° 13' N latitude and 105° 11'-110° 11' E longitude. According to the data from the *Chongqing Statistical Yearbook* from the years 2011 to 2020, the average of annual rainfall was 1221.07 mm, the annual average temperature 18.7°C, the average annual sunshine hours 1045.8 hours, and the annual average relative humidity 76.22%. The hottest month has an average temperature of 26 to 29°C, while the coldest month has an average temperature of 4 to 8°C; the extreme temperatures can reach a maximum of 43°C and a minimum of –3.2°C (Kou *et al*., 2019). Environmental conditions fundamentally shape the spatial distribution of plants. For instance, the development of plum fruitlets has been shown to vary significantly with time and climate (Mage & Gronnerod, 2007). The MaxEnt model, a probabilistic model that predicts distributions based on constraint conditions, is widely used in ecology and

Received: 05-05-2025 | Revised: 03-02-2026 | Accepted: 07-02-2026 | Online: 01-04-2026

species distribution modeling (Hernandez *et al*., 2006; Carvalho *et al*., 2015; Li *et al*., 2020). Compared to other models such as BIOCLIM, CLIMEX, DOMAIN, and GARP, the MaxEnt model is known for its stability, higher accuracy, and relative simplicity in operation (Hernandez *et al*., 2006). It has been widely applied in various areas, including predicting the distribution of endangered plants (Zhang, *et al*., 2022), potential species distribution (Cristina *et al*., 2022), suitable growth zone prediction (Jha & Jha, 2024), invasive plant distribution projection (Kanmaz *et al.,* 2023), and mapping the spatial distribution of medicinal plants (Ullah *et al.*, 2025).

Selenium (Se) is an essential trace element for the human body, and a beneficial element for plants. The content of Se in food varies depending on the region and soil conditions (Kieliszek & Sandoval, 2023). The soil Se content in the Chongqing area has not been fully measured, but in Nanchuan District, it has been reported to range from 0.056 to 10.8 mg/kg (Yu *et al*., 2020). In soil with high Se content, the plum fruits may also naturally accumulate Se, making them natural selenium-containing fruits. However, it remains unclear whether the Se content in these fruits meets China's standard for naturally selenium-enriched fruits (10-500 μg/kg FW). Therefore, it is necessary to detect the Se content in fruits from suitable planting areas of Nanchuan District. This study employs the MaxEnt model to investigate the bioclimatic characteristics of the crisp plum series in Chongqing, identify the key bioclimate variables influencing its distribution, and delineate its suitable habitats. The study will provide a scientific basis for the production of naturally Se-enriched orSe-containing crisp plum series in suitable regions of Chongqing.

Material and Methods

Occurrence data of crisp plum in Chongqing area: Experimental occurrence data of crisp plum in Chongqing area was collected through various channels such as newspapers, online resources, field surveys, and the China National Knowledge Internet platform (https://www.cnki.net/). The distribution locations of plum cultivation are identified down to the village level, with a minimum planting area of 0.33 hm^2 per site. The longitude and latitude coordinates for each location to village level are determined using the latitude and longitude query tool on the convenience query website (https://jingweidu.bmcx.com/). The 186 records of crisp plum series were as shown in Fig. 1.

Ecological data: In this study, the collection of 19 bioclimatic variables with a resolution of 2.5 arcminutes were selected from theWorld Climate Global Climate Database from 1970 to 2000 (WorldClim, http://www.worldclim.org) (Yang *et al*., 2022; Li *et al*., 2025). Including: annual average temperature (bio 1), average daily range (bio 2), isotherm (bio 3), seasonal temperature change (bio 4), warmest month maximum temperature (bio 5), coldest month minimum temperature (bio 6), annual average temperature range (bio 7), wettest quarter average temperature (bio 8), driest quarter average temperature (bio 9), warmest quarter average temperature (bio 10), coldest quarter average temperature (bio 11), annual precipitation (bio 12), the wettest month precipitation (bio 13), the driest month precipitation (bio 14), seasonal changes in precipitation (bio 15), the wettest quarter precipitation (bio 16), the driest quarter precipitation (bio 17), the warmest quarter precipitation (bio 18), and the coldest quarter precipitation (bio 19). The altitude (alt) data was sourced from the Geospatial Data Cloud (https:// www.gscloud.cn/ sources/ index?pid =1&type=1).

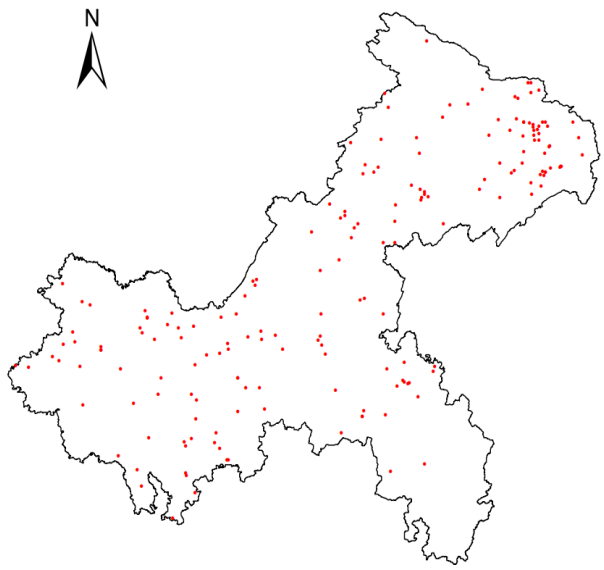

Fig. 1. Occurrence data of the crisp plum series in the Chongqing area. The boundary was obtained from Planting Cloud (http://www.guihuayun.com/maps/region.php). The red markers indicate the acquisition points.

Modelling process: To enhance the accuracy of the detection, MaxEnt was used to calculate the percent contribution of 19 bioclimatic variables and 1 altitude factor. The dataset was randomly divided into a training set (75% of the data) and a testing set (25% of the data) (Yang *et al*., 2022). The results showed that the average Area Under the Curve (AUC) values for the training set and testing set were 0.806 and 0.661, respectively. Since the accuracy of the testing set was relatively low, in order to improve precision, the variables with contribution rates greater than 2 % (bio 8, bio 16, bio 18, bio 14, bio 4, bio 6, bio 12, bio 17) were selected based on the results in Table 1.

And then the 186 occurrence data of crisp plum series in 'csv' format and the eight environmental variables in 'asc' format were imported into the 'sample' and 'environmental layers' data boxes, respectively. A 25% sample was also used as the test set, with 10 repetitions, to simulate the suitable habitat for plum in Chongqing. After repeated iterations of MaxEnt 3.4.1 model on the distribution information of plum in the Chongqing region and environmental factors, the ROC curve is shown in Fig. 2. The mean AUC value is 0.754, indicating good predictive accuracy. The results are outputted in logistic format. The results of the maximum entropy model are then imported into ArcGIS version 10.7 for reclassification, with species distribution probability set as the criterion. P values within the range of 0-0.05 indicate unsuitable areas, 0.05-0.33 indicate low suitability (Li *et al*., 2020), 0.33-0.665 indicate moderate suitability, and 0.665-1 indicate high suitability.

Table 1. The contribution rate of environmental variables impacting the distribution of crisp plum series in Chongqing.

Parameters	Code	Contribution rate (%)
Wettest quarter average temperature (ºC)	Bio 8	25.8
The wettest quarter precipitation (mm)	Bio 16	19.5
The warmest quarter precipitation (mm)	Bio 18	13.5
The driest month precipitation (mm)	Bio 14	13.4
Seasonal temperature change (×100ºC)	Bio 4	11.2
Coldest month minimum temperature (ºC)	Bio 6	2.5
Annual precipitation (mm)	Bio 12	2.4
The driest quarter precipitation (mm)	Bio 17	2.2
Altitude (m)	alt	1.8
Warmest quarter average temperature (ºC)	Bio 10	1.7
Seasonal changes in precipitation (mm)	Bio 15	1.3
Annual average temperature (ºC)	Bio 1	1.3
Mean diurnal range (ºC)	Bio 2	1.3
Warmest month maximum temperature (ºC)	Bio 5	1
Annual average temperature range (ºC)	Bio 7	0.7
Isotherm (0ºC)	Bio 3	0.2
The wettest month precipitation (mm)	Bio 13	0.2
The coldest quarter precipitation (mm)	Bio 19	0.1
Driest quarter average temperature (ºC)	Bio 9	0
Coldest quarter average temperature (ºC)	Bio 11	0

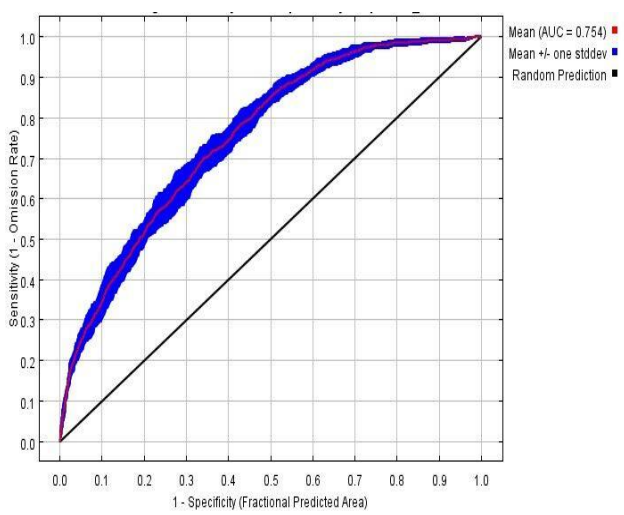

Fig. 2. The ROC curve for predicting the potential distribution of the crisp plum series in the Chongqing area.

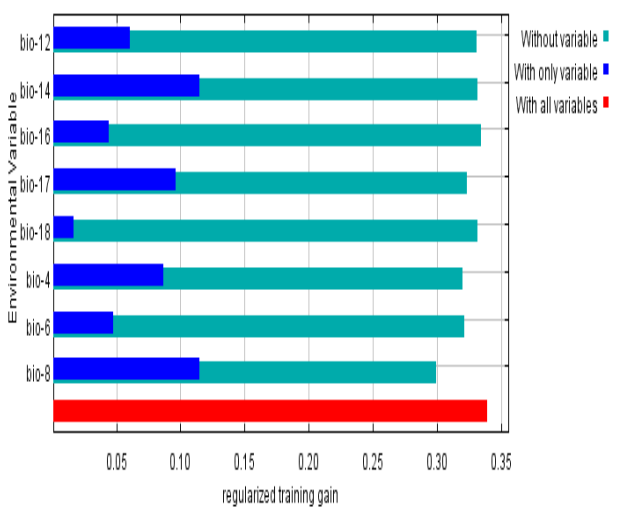

Fig. 3. Importance of eight environmental variables in the growth of the crisp plum series using jackknife analysis.

Fruit Se content: A total of 20 fruit samples were collected at commercial maturity in the Nanchuan area. 18 fruit samples were collected in 2017, the total Se content was measured by atomic fluorescence spectroscopy (AFS). And the two samples were collected in 2023, the total Se content was measured by inductively coupled plasma mass spectrometry on an X series instrument (ICP-MS, Thermo Fisher Scientific, USA) provided by Sci-Tech innovation Co. Ltd (Qingdao, China).

Fruit quality: The transverse and longitudinal diameters of individual fruits were measured by a vernier caliper. Fruit weight was measured by an electronic balance. Soluble solid content (%) was assessed with a refractometer (Atogo, ATC-1, Japan). Fruits hardness was measured using a sclerometer (Lvbo, GY-1, Hebei, China), after cutting a 1 cm^2 section of the fruit peel.

Results and Analysis

Jackknife analysis results: The eight environmental variables were selected according to the environmental factor correlation and jackknife procedure (Fig. 3). The four environmental factors that had the greatest impact on the normalized training gain were bio 4 (temperature seasonality), bio 8 (mean temperature of wettest quarter), bio 14 (precipitation of driest month), and bio 17 (precipitation of driest quarter).

Mainly environmental factor response curves analysis: The survival probability of crisp plum was analyzed based on the response curves of the selected environmental factors. When the survival probability reaches 0.5 or higher, it was considered suitable for the species to grow, indicating the best environment for survival (Hou *et al*., 2023). According to the curve in Fig.

4, the survival probability of crisp plum increased with increasing bio 4 and bio 8. The survival probability (logistic output) exceeded 0.5 when bio 4 was higher than 7.45°C and bio 8 was higher than 22°C. The best precipitation range for bio 14 was between 14 mm and 21 mm, while the best precipitation range for bio 17 was between 55 mm and 83 mm. These ranges provided the maximum survival probability for crisp plum.

Prediction of suitable habitat of crisp plum in Chongqing area and Nanchuan region: The fitness level was used to divide the areas into four categories: unsuitable, low-suitable, moderate-suitable, and high-suitable (Fig. 5). In Chongqing, the high-suitable area for crisp plum was the narrowest and mainly located in the northeast, including Wushan and Wuxi city. The moderate-suitable area was the largest and included Fengjie, Yuyang, Kaixian, Wanzhou, Liangping, Zhongxian, Fengdu, Dianjiang, Fuling, Changshou, Nanchuan, Qijiang, Wansheng, Jiangjin, Tongnan, Dazu, Tongliang, and Zhucheng City. The low-suitable area included Rongchang, Yongchuan, Pengshui, Youyang, Qianjiang, Pengshui, Shizhu, Wulong, Chengkou, and Nanchuan. The unsuitable area was mainly found in Shizhu, Fengdu, Fuling, Fengjie, Chengkou, Youyang, and Xiushan.

In our study, we focused on the Nanchuan region to analyze the Se content in crisp plum. We found that the moderate-suitable area for crisp plum was primarily located in the northern and central parts of the Nanchuan region. On the other hand, the low-suitable area and unsuitable area were mainly distributed in the southern parts of the region.

Areas of suitable habitat in Chongqing area: After reclassifying and converting the results obtained from MaxEnt, the area of crisp plum in different suitability categories in Chongqing was calculated and presented in Table 2. The moderate-suitable area had the largest extent, covering approximately 4.93×10^4 km^2, which accounted for 59.54% of the total area. It was followed by the low-suitable and unsuitable areas. The high-suitable area had the narrowest range, located in the northeast of Chongqing, with an area of about 0.26×10^4 km^2, accounting for 3.21% of the total area.

Table 2. Areas of crisp plum under unsuitable area, low-suitable area, moderate-suitable area, and high-suitable area in Chongqing.

Climate scenarios	Area ($\times10^4$ km^2)	Percentage (%)
Unsuitable area	0.43	5.28
Low-suitable area	2.61	31.67
Moderate-suitable area	4.93	59.94
High-suitable area	0.26	3.21

The suitable area of soil Se content and plum cultivars: In China, cultivated soil with Se content ranging from 0.4-3.0 mg/kg is considered Se-enriched soil. Among the high and moderate-suitable areas for plum cultivation, more than 10 counties have reported having Se-rich soil. For instance, Jiangjin has 17,100 hm^2 of selenium-rich soil, Zhongxian has 2,554 hm^2, Nanchuan has 349.7 hm^2, and Yubei has 208.3 hm^2 (Sun *et al*., 2023). The main varieties planted in these areas are the 'Qingcui' series, accounting for 80% of the plantings, followed by the 'Cuihong' series and Nai series (Xiang 2022) as shown in Table 3.

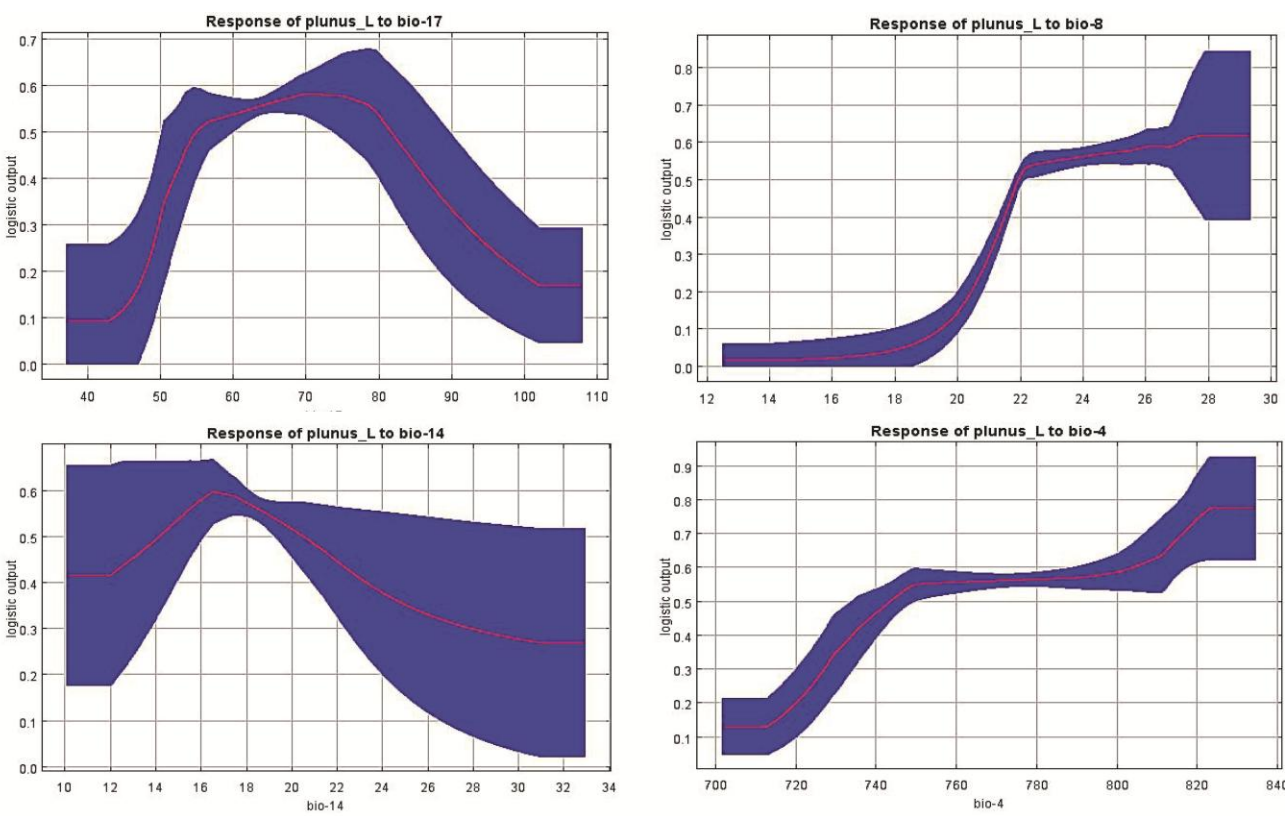

Fig. 4. Environmental factor response curve. Bio 4: temperature seasonality; bio 8: mean temperature of the wettest quarter; bio 14: precipitation of the driest month; bio 17: precipitation of the driest quarter.

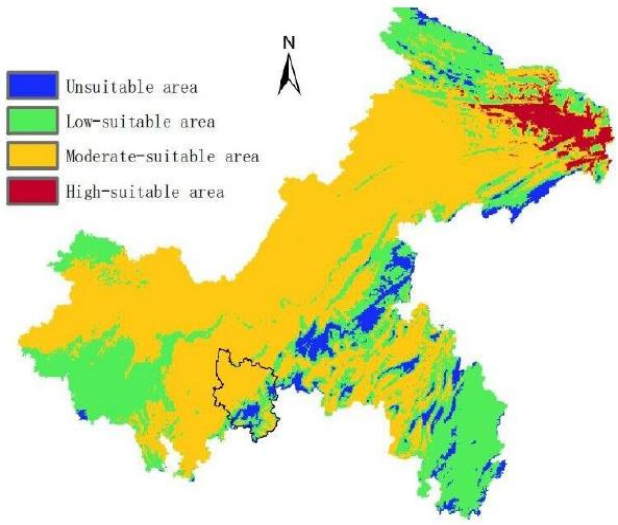

Fig. 5. Potential distribution area of crisp plum based on climate conditions in Chongqing. The boundary of the Nanchuan region was obtained from Planting Cloud (http://www.guihuayun.com/maps/region.php).

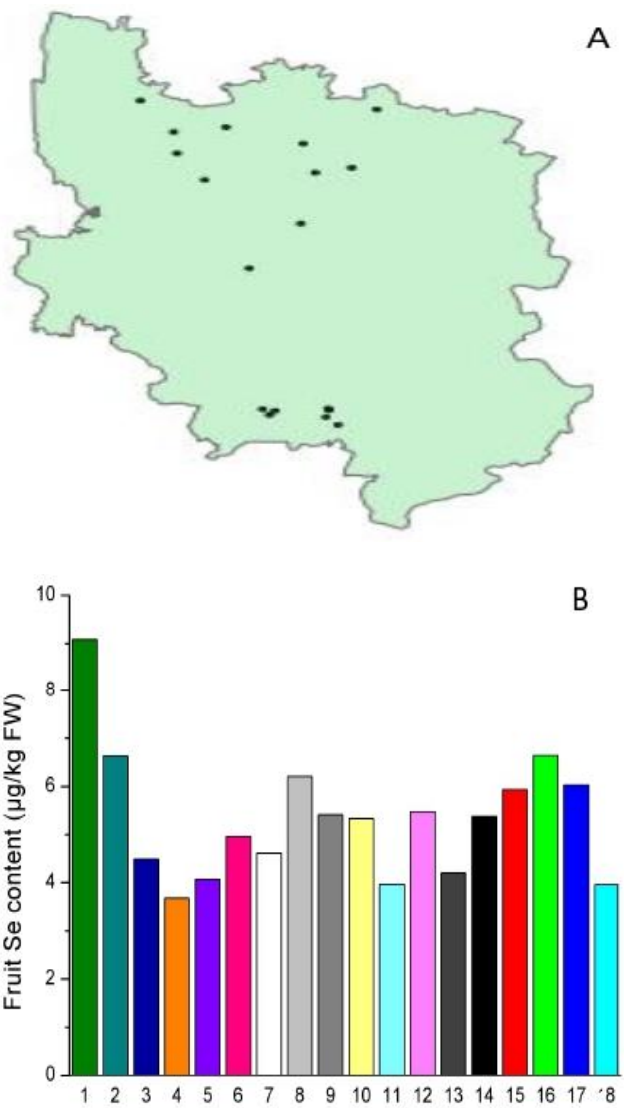

Fig. 6. Se content in crisp plum fruits in Nanchuan. A: Acquisition points shown in dark color; B: Fruit Se content detected in 2017.

Crisp plum Se content in Nanchuan region: In China, fruit with Se content ranging from 10 to 500 μg/kg FW is considered Se-enriched fruit, while fruit with Se content ranging from 0 to 10 μg/kg FW is considered Se-containing fruit. The fruit Se content in this study ranged from 3.8 to 9.1 μg/kg FW (Fig. 6), which was below the minimum threshold (10 μg/kg FW) in China. However, it did meet the standards for Se-contained fruits.

Crisp plum quality in Nanchuan region: The transverse diameter, longitudinal diameter, and fruit weight in Jinshan town were significantly larger than those in Dongcheng Street, by 10.64 %, 11.86%, 24.63%, respectively (Table 4). Conversely, fruit hardness and soluble solids from Dongcheng Street were notably higher at 29.74% and 27.12%, respectively, compared to those from Jinshan Town. There was no significant difference in the Se content between the two areas, and both were below the threshold for naturally Se-enriched fruits (10 μg/kg FW) in China.

Discussion

Model prediction of suitable habitat has been developed as an effective way to protect and evaluate crop suitability (Hou *et al*., 2023). But the model has certain limitations in terms of data bias, variable selection, model transferability, and validation methods (Lissovsky *et al*., 2021).

The ecological suitability of plum trees is influenced by human factors, and the cultivated area of plum in Chongqing has increased from 2.9×10^4 km^2 in 2014 to 9.59×10^4 km^2 in 2021. To improve the accuracy of the MaxEnt model, Xia *et al*., (2023) employed appropriate methods such as data preprocessing, feature selection and engineering, integration of multiple data sources, inclusion of relevant factors, and validation and calibration. In our study, by selecting eight factors from 20 environmental factors through data preprocessing, the AUC value of the MaxEnt model improved from 0.66 (low prediction accuracy) to 0.75 (good prediction accuracy), indicating acceptable model performance according to commonly used thresholds (AUC＞0.7).

Our simulation showed that the most suitable habitat for plum trees was distributed in the northeast of Chongqing, including Wushan, Wuxi, and Fengjie. Wushan County is recognized as the ‘Hometown of Chinese crisp plum’ with a long history. In 2023, the total area of ‘Wushan’ crisp plum is estimated to be 0.13×10^4 km^2, with a production of 135,000 tons and a comprehensive output value expected to exceed 1.8 billion yuan (Wang, 2023). Wuxi County mainly cultivates late-maturing crisp plum series, including 'Jiuquanxiang’, 'Wuxiwan’, and ‘Wushan’. According to Chongqing Daily, the planting area for late-maturing crisp plum series is approximately 0.0133×10^4 km^2, with an estimated production of around 60,000 tons and a value of approximately 500 million yuan. Fengjie County has a plum planting area of about 0.013×10^4 km^2. The government has designated six counties, including Wushan, Wuxi, Fengjie, Yunyang, Kaizhou,

and Wanzhou, as the 'Wushan' crisp plum brand cultivation area (Development Plan for Crispy Plums, Navel Oranges, and Longan Lychees in Chongqing City). However, the actual planting area of crisp plum is much smaller than its suitable area, as there are other suitable plants being cultivated in different seasons. With the support of the government and farmers' perception, crisp plum cultivation has spread to various areas of Chongqing, with more varieties of crisp plums available. In reality, crisp plum is mainly planted in the moderate-suitable area, covering approximately 0.63×10^4 km^2, and the cultivars include 'Jincui', 'Fendai', 'Dashan', 'Qingcui', 'Fengtang', 'Mi', 'Waizui', 'Xiantao', 'Huangchi', 'Shatang', and others. However, MaxEnt predictions have revealed significant differences in climate characteristics between other regions in Chongqing and the place of origin of crisp plum, Wushan County, which is in the high-suitable area. The main environmental factors influencing the suitability of crisp plum cultivation are temperature and precipitation. The probability of survival increases with an increase in bio 4 (temperature seasonality) and bio 8 (mean temperature of wettest quarter), indicating greater variations in temperature throughout the seasons and higher mean temperature of the wettest quarter. The precipitation factors, bio 14 (precipitation of driest month) and bio 17 (precipitation of driest quarter), also play a role. By implementing reasonable irrigation during the driest month or quarter, growth performance can be enhanced, but controlling the temperature in the field for crisp plum trees is relatively challenging.

Currently, the planting area of plums in Nanchuan is 20 km^2, with over 10 varieties, including 'Qingcui', 'Cuihong', and 'Yinhong' plum. According to Shangyou News, the plum production is 19,000 tons, with over 30 picking bases scattered across Xicheng Street, Jinshan Town, Shanquan Town, and Shiqiang Town. In our study, Nanchuan County was divided into moderate-suitable, low-suitable, and unsuitable areas. The moderate-suitable crisp plums (Chengdong Street) were crisper and sweeter compared to those in the low-suitable area (Jinshan Town), but the advantage in fruit weight was not evident. The crisp plum under moderate-suitable area was mainly distributed in the northwest region, while the low-suitable and unsuitable areas were mainly distributed in the southeast region. In Nanchuan County, the areas with soil Se enrichment were mainly distributed in Shuijing Town, Nanping Town, Nanchuan urban area, and Jinfo Mountain (Yu *et al*., 2020). Many studies have shown that applying Se fertilizer can improve the fruit setting rate, fruit antioxidant status, and quality of fruits (Hernandez-Hernandez *et al.*, 2019; Abdel-Hak *et al*., 2022; Sarinana-Navarrete *et al.*, 2023). In the natural environment, the transport capacity of Se in tree fruits is poor. In our study, we collected 20 plum samples planted in the moderate-suitable and low-suitable areas had Se content ranging from 3.8 to 9.1 μg/kg, which did not meet the standard for naturally Se-enriched fruits. The distribution of Se content higher than 0.4 mg/kg in the Nanchuan region was mainly in the southern and central parts (Yu *et al.*, 2020). Similarly, the fruit Se content in Wushan, produced in the five main planting areas of 'Wushan' crisp plum, ranged from 0.45 to 7.71 μg/kg FW (Hao *et al.*, 2021), which also did not meet the standard, even though the soil is Se-enriched (Sun *et al.*, 2023). Under natural conditions, it is difficult for fruit trees to accumulate Se in their fruits such as pear (Wang *et al.,* 2023), apple (Wojcik *et al*., 2024). While dry fruit can accumulate more Se for human intake, such as Brazil nuts (Alcantara *et al.*, 2022).

Table 3. Distribution of counties in the ecological high-suitable area and the situation of selenium-rich soil and varieties.

Plum advantaged regions (Fig. 5)	Counties (Selenium-rich Soil Area, Reporting of Selenium-rich Situation) (Sun *et al*., 2023)	Main cultivated varieties series (Proportion)
Northeast Chongqing	Wushan, Wuxi, Fengjie (with Se-rich soil), Yunyang, Kaixian, Wanzhou, Liangping, Zhongxian (2554 hm^2), Dianjiang	'Qingcui' series (80%) (Xiang 2022), 'Cuihong' series, Nai series
West Chongqing	Tongnan, Hechuan, Tongliang, Jiangjin (17,100 hm^2), Dazu (with selenium-rich soil), Nanchuan (349.7 hm^2) (Yu *et al.*, 2020)	
Main Urban Areas	Yubei (208.3 hm^2), Beibei (with Se-rich soil), Changshou (with selenium-rich soil), Fuling (with selenium-rich soil), Banan (with Se-rich soil)	

Table 4. Fruit quality in Dongcheng Street (Moderate-suitable area) and Jinshan Town (Low-suitable area) in the Nanchuan Region in 2023.

Parameters	Dongcheng Street	Jinshan Town
Transverse diameter (mm)	38.13 ± 1.20b	42.67 ± 3.21a
Longitudinal diameter (mm)	35.14 ± 1.20b	39.87 ± 1.74a
Fruit weight (g)	29.96 ± 2.20b	39.75 ± 4.46a
Hardness (kg/cm^2)	10.60 ± 1.36a	8.17 ± 1.30b
Soluble solids (%)	14.39 ± 0.96a	11.32 ± 1.42b
Se content (μg/kg FW)	6.03 ± 1.57a	6.65 ± 0.52a

Different letters indicate significant differences at the LSD ($p<0.05$) level

Conclusion

Our study predicted the suitable habitat of crisp plum in the Chongqing area using MaxEnt model based on eight different environmental factors. The high-suitable area for crisp plum is mainly distributed in the northeast of Chongqing. The moderate-suitable area is the largest, covering about 4.93×10^4 km^2 and accounting for 59.54% of the total area. The most important environmental factors are bio 4 (temperature seasonality), bio 8 (mean temperature of wettest quarter), bio 14 (precipitation of driest month), and bio 17 (precipitation of driest quarter). The 'Qingcui' crisp plum series were the main cultivars, mainly planted in the

moderate-suitable area with varying soil Se content. In Nanchuan, the plum Se content does not meet the standard for naturally Se-enriched fruits but meets the standard for naturallySe-containing fruits. The predicted results of this study can serve as a basis for optimizing the ecological cultivation of plums in Chongqing and provide guidance for the production of high-quality and Se-containing crisp plums. Moreover, compared to fruit, dry fruit such as walnuts, chestnuts, pistachios can accumulate higher levels of Se. In the future, the study of distribution of ecologically suitable areas for dry fruits and the planning of naturally Se-enriched dry fruit cultivation can be more feasible.

Acknowledgments

This research was financially supported by Yili Normal University introduced talent scientific research start-up project (2025RCYJ84) and and Chongqing Fuling District Science and Technology Plan Project (FLKJ, 2024BAN5138 and FLKJ, 2025AAN2053).

Conflict of Interest: The authors have declared that no competing interests exist.

Author's Contribution: Xieping Sun and Hongqun Li conceived and designed the study. Fei Yu and Shizhen Li collected plum fruit samples and determined the selenium content. Xieping Sun and Hongqun Li performed MaxEnt model-based data analysis. Xieping Sun drafted the original manuscript, and Hongqun Li and Shizhen Li reviewed and edited the manuscript. All authors read and approved the final manuscript.

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