Stability Analysis of Chemical Quality of Tobacco Leaves in Honghe Prefecture of Yunnan Province

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Abstract. To comprehensively analyze the stability of the chemical quality of tobacco leaf in Honghe State, and to provide a basis for finding ways to narrow the difference between tobacco leaf quality in Honghe State and maintaining the stability of the quality of tobacco leaves in the tobacco producing area. Statistics were used to analyze the annual stability of Honghe tobacco leaves and the stability of the tobacco planting range from 2014 to 2017. The chemical quality of Honghe tobacco leaves was not stable in different years, the total sugar and reduced sugar content showed the trend of decreasing year by year, in addition, the potassium and chlorine content of the tobacco leaves in this tobacco planting area had been at a low level for four consecutive years. In 2014 - 2017, the total sugar, reduced sugar and chlorine content of the tobacco leaves in Honghe State were all relatively small, while the variation coefficient values of nicotine and potassium content in tobacco leaves were large, while the chlorine content in tobacco leaves was extremely unstable between years. For four consecutive years, the chemical quality of tobacco leaves in seven tobacco - planting counties and cities in Honghe State was significant. The chemical quality of tobacco leaves in Honghe State was unstable between different counties and cities.

1 Introduction

The quality of tobacco leaves is closely related to the quality of cigarettes, and its quality characteristics directly affect the final quality of cigarette products^[1]. Because the growth of tobacco leaves is affected by many factors such as ecological environment, soil, cultivation methods^[2], the instability of physical, chemical and biological characteristics of tobacco leaves^[3], which has a serious impact on the uniformity of tobacco quality. At present, the tobacco market is increasingly pursuing the stability and homogeneity of tobacco leaves^[4]. The stable quality of raw materials has become an important factor to maintain the quality of tobacco leaves, especially the chemical stability of tobacco leaves, which directly determines the smoke characteristics of tobacco leaves and the availability of industrial production^[5]. It has become the main reason to ensure the market value of middle and high-end tobacco brands. In the existing studies, the stability of tobacco leaves in Deyang^[6], Yunnan's main tobacco producing areas^[1,7], Lichuan^[8], Wenshan^[9], Hengyang^[10], Zunyi^[11], Panzhihua^[5] were analyzed, and it was found that the quality of tobacco leaves in the same tobacco growing area varied between years. It can be seen that the instability of tobacco leaf quality has become an obvious problem in tobacco growing areas in China. Honghe

Prefecture, located in the southeast of Yunnan Province, has unique natural conditions for flue-cured tobacco production, and is an excellent flue-cured tobacco production area in Yunnan Province. Because the ecological environment, soil fertility and cultivation conditions of tobacco growing areas in Honghe counties and cities are different, the comprehensive quality of tobacco leaves is also different^[12]. At present, there are few studies on the stability of Yunnan Honghe tobacco leaves. The author intends to analyze the chemical properties of tobacco in Honghe Prefecture from 2014 to 2017, focusing on the differences between years and tobacco growing areas, and comprehensively evaluate the stability and changing trend of chemical quality of tobacco leaves in Honghe Prefecture, so as to provide a basis for finding ways to reduce the differences of tobacco quality in Honghe Prefecture and maintaining the stability of tobacco quality in this tobacco growing area.

2 Materials and Methods

2.1 Sample Collection

From 2014 to 2017, tobacco leaves were sampled from the main tobacco areas of Honghe Prefecture (Gejiu,

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Jianshui, Kaiyuan, Luxi, Mengzi, Mile and Shiping). The main tobacco varieties were K326, Hongda and Yun87. Sampling information of counties and municipalities in different years is shown in Table 1, of which the largest number is in 2017, followed by 2014, and similar in 2015 and 2016.

Table 1. Sampling number of tobacco plants in different counties and cities of Honghe Prefecture from 2014 to 2017

Year	Gejiu	Jianshui	Kaiyuan	Luxi	Mengzi	Mile	Shiping	Total
2014	29	117	57	228	69	261	126	887
2015	9	22	11	32	17	34	18	143
2016	6	22	11	33	15	36	24	147
2017	107	586	285	626	246	880	426	3156

2.2 Determination of Chemical Index of Tobacco Leaf

The chemical composition of tobacco leaves was detected by Honghe Cigarette Factory of Honghe Hongyun Group Co., Ltd. The contents of total sugar, reducing sugar, nicotine, chloride ion, leaf nitrogen and leaf potassium in tobacco leaves were determined respectively.

2.3 Statistical Analysis

Data were analyzed by Excel and SPSS 19.0 software.

3 Results and analysis

3.1 Analysis of routine chemical indexes of tobacco leaves in different years in Honghe Prefecture

3.1.1 Difference analysis of conventional chemical indicators of tobacco leaves in different years in Honghe Prefecture

According to the analysis results of routine chemical indexes of tobacco leaves in different years in Honghe Prefecture (Table 2), the contents of routine chemical indexes of tobacco leaves in Honghe Prefecture were significantly different for four consecutive years from 2014 to 2017. Specific analysis of indicators: total sugar content in 2014, 2015 > 2016 > 2017; reducing sugar content in different years and total sugar changes were similar, showing the size of 2015 > 2014 > 2016 > 2017, and the two indicators showed a decreasing trend year by year; analysis of nicotine differences in different years, the highest content in 2015 and 2017 Secondly, in 2014, the lowest in 2016, and the difference reached a significant level. From the results of leaf potassium, it can be seen that the potassium content was generally low for four consecutive years, with the highest in 2014 and 2017, which was significantly higher than that in 2015 and 2016. In recent years, the chlorine content of tobacco leaves in Honghe Prefecture was on the low side as a whole, showing that the chlorine content of tobacco

leaves in the fourth consecutive year was 2014 > 2015 > 2017 > 2016. From the results of tobacco leaf nitrogen, it can be seen that there are significant differences in tobacco leaf nitrogen content between 2014 and 2017 in Honghe Prefecture, with the highest in 2017, the second in 2014 and 2015, and the lowest in 2016. Overall, the chemical quality of tobacco leaves in Honghe Prefecture was unstable, and the contents of total sugar and reducing sugar decreased year by year. In addition, the contents of potassium and chloride ions in tobacco leaves in Honghe Prefecture were at a low level for four consecutive years, which resulted in poor combustibility, weak elasticity and fragile tobacco leaves.

Table 2. Difference analysis of conventional chemical indicators of tobacco leaves in different years in Honghe Prefecture (%)

Year	Total sugar	Reducing sugar	Nicotine	Leaf potassium	Leaf chlorine	Leaf nitrogen
2014	31.99± 5.03a	26.46± 4.31b	2.61± 0.94b	1.70± 0.42a	0.30± 0.26a	2.07± 0.54b
2015	32.63± 5.13a	27.32± 4.26a	2.77± 0.58a	1.49± 0.39b	0.28± 0.23ab	2.06± 0.35b
2016	30.71± 4.20b	25.32± 3.27c	2.43± 0.51c	1.43± 0.32b	0.18± 0.15c	1.93± 0.35c
2017	24.36± 6.08c	20.08± 4.24d	2.82± 0.84a	1.73± 0.52a	0.24± 0.23b	2.44± 0.43a
P value	0	0	0	0	0	0

Note: The data in the table are means ± standard deviation. Different little letters in the same column indicate significant differences (P < 0.05). The below are same.

3.1.2 Variation coefficient analysis of conventional chemical indicators of tobacco leaves in different years in Honghe Prefecture

By calculating the coefficient of variation of conventional chemical indexes of tobacco leaves in different years, the dispersion degree of chemical components in different years can be analyzed. The specific results are shown in Table 3. The variation coefficients of total sugar, reducing sugar and nitrogen content of tobacco leaves in Honghe prefecture were small, and the variation coefficients of each index had little difference for four consecutive years, which indicated that the contents of three indexes in Honghe prefecture were relatively stable; the variation coefficients of nicotine and leaf potassium content in Honghe prefecture were relatively large, and the variation values of potassium content in tobacco leaves were relatively stable for four consecutive years. However, the variation of nicotine among years is quite different. The dispersion of chlorine content in tobacco leaves in Honghe Prefecture is very high, which indicates that the chlorine content in tobacco leaves in the tobacco area is extremely unstable. How to stabilize the chloride ion content in tobacco leaves in this tobacco area is an urgent problem to be solved.

Table 3. Comparison of variation coefficients of conventional chemical indicators of tobacco leaves in different years in Honghe Prefecture (%)

Year	Total sugar	Reducing sugar	Nicotine	Leaf potassium	Leaf chlorine	Leaf nitrogen
2014	0.16	0.16	0.36	0.25	0.87	0.26

2015	0.16	0.16	0.21	0.26	0.82	0.17
2016	0.14	0.13	0.21	0.22	0.83	0.18
2017	0.25	0.21	0.30	0.30	0.96	0.17
Mean	0.18	0.17	0.27	0.26	0.87	0.20

3.2 Difference analysis of conventional chemical indicators of tobacco leaves in different counties and cities of Honghe Prefecture from 2014 to 2017

3.2.1 Difference analysis of conventional chemical indicators of tobacco leaves in different counties and cities of Honghe Prefecture in 2014

From the comparison of routine chemical indexes of tobacco leaves in different counties and cities in Honghe Prefecture in 2014, it can be seen that the contents of total sugar, reducing sugar, nicotine, leaf potassium, leaf chlorine and leaf nitrogen in seven counties and cities in this year were significantly different ($P < 0.05$). Specific analysis of each index: the total sugar content of different counties and cities is significantly different, showing the size: Luxi, Mile > Mengzi, Shiping > Jianshui > Gejiu > Kaiyuan; the difference of reducing sugar content and total sugar results is not uniform, the index size of seven counties and cities is: Shiping > Mile, Mengzi > Luxi > Gejiu, Jianshui > Kaiyuan; Nicotine results can be used. It can be seen that the nicotine results in seven counties are relatively stable, among which Shiping and Jianshui are the highest, Gejiu and Kaiyuan are the second, Luxi, Mengzi and Mile are the lowest; the difference of potassium in tobacco leaves in seven counties and cities is also obvious, showing the size as follows: Gejiu > Shiping > Jianshui, Kaiyuan, Mengzi > Mile > Luxi. Water content is the highest, significantly higher than other counties and cities, Gejiu and Mengzi are the lowest; leaf nitrogen content is relatively stable in different counties and cities, among which Gejiu, Jianshui, Kaiyuan and Shiping are the highest, Mengzi is the second, Luxi and Mile are the lowest.

Table 4. Difference analysis of conventional chemical indicators of tobacco leaves in different counties and cities of Honghe Prefecture in 2014 (%)

Counties (cities)	Total sugar	Reducing sugar	Nicotine	Leaf potassium	Leaf chlorine	Leaf nitrogen
Gejiu	29.78±6.01cd	25.02±5.79cd	2.74±0.78ab	1.96±0.27a	0.14±0.03d	2.22±0.46a
Jianshui	30.92±4.62bc	24.98±3.87cd	2.88±0.91a	1.75±0.45bc	0.35±0.34a	2.22±0.53a
Kaiyuan	29.02±5.08d	23.97±4.72d	2.65±0.91ab	1.79±0.37bc	0.18±0.10cd	2.24±0.59a
Luxi	32.94±4.69a	26.37±4.01bc	2.48±0.98b	1.52±0.33d	0.43±0.32a	1.99±0.54b
Mengzi	31.51±4.25ab	26.69±3.48ab	2.45±0.76b	1.77±0.29bc	0.17±0.09d	2.13±0.47ab
Mile	32.83±4.83a	27.16±3.96ab	2.43±0.94b	1.70±0.43c	0.26±0.16b	1.96±0.51b
Shipin	31.65±5.67ab	27.84±4.84a	2.97±0.92a	1.86±0.47ab	0.25±0.21bc	2.20±0.57a
P value	0	0	0	0	0	0

3.2.2 Difference analysis of conventional chemical indicators of tobacco leaves in different counties and cities of Honghe Prefecture in 2015

From Table 5, it can be seen that in 2015, the content of each chemical index of tobacco leaves in different counties and cities in Honghe Prefecture was significantly different, reaching a significant level ($P < 0.05$). Specific analysis of the indicators: in 2015, the total sugar content of tobacco leaves in seven counties and cities in Honghe Prefecture can be divided into two levels. The total sugar content of Gejiu, Luxi, Mengzi and Mile tobacco leaves is higher than that of other counties and cities, and the reducing sugar content of tobacco leaves in different counties and cities is obviously different, showing Gejiu > Luxi, Mengzi, Mile > Shiping > Kaiyuan > Jianshui as a whole. From the results of nicotine, we can see that the nicotine content of seven counties and cities is Jianshui > Shiping > Kaiyuan > Luxi > Mile, Mengzi > Gejiu; in 2015, the potassium content of tobacco leaves in different counties and cities of Honghe is obviously different, among which Shiping and Jianshui are the highest, followed by Gejiu, Kaiyuan, Mile and Mengzi are the lowest, while Luxi is the lowest. There were obvious differences in chlorine content in tobacco leaves, showing Shiping > Luxi, Mile > Jianshui, Mengzi > Kaiyuan > Gejiu. In this year, leaf nitrogen content in different counties and cities of Honghe Prefecture could also be divided into two levels, among which Kaiyuan, Shiping and Jianshui were the highest, significantly higher than other counties and cities.

Table 5. Difference analysis of conventional chemical indicators of tobacco leaves in different counties and cities of Honghe Prefecture in 2015 (%)

Counties (cities)	Total sugar	Reducing sugar	Nicotine	Leaf potassium	Leaf chlorine	Leaf nitrogen
Gejiu	36.50±5.07a	30.33±4.72a	2.25±0.42d	1.64±0.23ab	0.13±0.04c	1.87±0.24b
Jianshui	28.41±5.43b	23.06±3.88d	3.22±0.51a	1.73±0.39a	0.29±0.17abc	2.21±0.29a
Kaiyuan	29.59±5.25b	25.30±4.87cd	2.94±0.62abc	1.40±0.21b	0.17±0.10bc	2.28±0.45a
Luxi	34.44±4.76a	28.98±3.89ab	2.68±0.56bc	1.17±0.31c	0.31±0.21ab	1.98±0.36b
Mengzi	34.08±2.53a	28.17±1.95ab	2.60±0.36cd	1.44±0.25b	0.19±0.12abc	1.97±0.28b
Mile	34.25±4.19a	28.33±3.88ab	2.61±0.54cd	1.45±0.34b	0.32±0.31ab	1.94±0.33b
Shipin	30.07±4.06b	26.58±2.94bc	3.03±0.57ab	1.83±0.40a	0.36±0.29a	2.26±0.24a
P value	0	0	0	0	0.047	0

3.2.3 Difference analysis of conventional chemical indicators of tobacco leaves in different counties and cities of Honghe Prefecture in 2016

The results of routine chemical index analysis of tobacco leaves in different counties and cities of Honghe Prefecture in 2016 are shown in Table 6. It can be seen that the contents of total sugar, reducing sugar, leaf potassium and leaf chlorine in tobacco leaves of seven counties and cities in this year were significantly different, and reach significant levels ($P < 0.05$), while the contents of nicotine and leaf nitrogen were not significantly different. Specific analysis: In 2016, the

total sugar content of tobacco leaves in seven counties and cities in Honghe Prefecture was significantly different, among which Mengzi and Mile had the highest content, Gejiu, Kaiyuan, Luxi and Shiping had the lowest, Jianshui, Mile and Shiping had the highest content, Jianshui, Kaiyuan, Mengzi had the second and Luxi had the lowest. The potassium content of tobacco leaves in different counties and cities of Honghe Prefecture in 2016 can be divided into two levels: Luxi is lower than other counties and cities, but there was no significant difference among other counties and cities. The chlorine content of tobacco leaves in Honghe Prefecture in 2016 can also be divided into two levels, among which Jianshui was the highest, which was significantly higher than other counties and cities, while there was no significant difference among other counties and cities.

3.2.4 Difference analysis of conventional chemical indicators of tobacco leaves in different counties and cities of Honghe Prefecture in 2016

The results of routine chemical index analysis of tobacco leaves in different counties and cities of Honghe Prefecture in 2016 are shown in Table 6. It can be seen that the contents of total sugar, reducing sugar, leaf potassium and leaf chlorine in tobacco leaves of seven counties and cities in this year were significantly different, and reach significant levels ($P < 0.05$), while the contents of nicotine and leaf nitrogen were not significantly different. Specific analysis: In 2016, the total sugar content of tobacco leaves in seven counties and cities in Honghe Prefecture was significantly different, among which Mengzi and Mile had the highest content, Gejiu, Kaiyuan, Luxi and Shiping had the lowest, Jianshui, Mile and Shiping had the highest content, Jianshui, Kaiyuan, Mengzi had the second and Luxi had the lowest. The potassium content of tobacco leaves in different counties and cities of Honghe Prefecture in 2016 can be divided into two levels: Luxi was lower than other counties and cities, but there was no significant difference among other counties and cities. The chlorine content of tobacco leaves in Honghe Prefecture in 2016 can also be divided into two levels, among which Jianshui was the highest, which was significantly higher than other counties and cities, while there was no significant difference among other counties and cities.

Table 6. Difference analysis of conventional chemical indicators of tobacco leaves in different counties and cities of Honghe Prefecture in 2016 (%)

Counties (cities)	Total sugar	Reducing sugar	Nicotine	Leaf potassium	Leaf chlorine	Leaf nitrogen
Gejiu	31.52±4.84ab	26.16±3.64a	2.29±0.43a	1.44±0.18a	0.12±0.05b	1.95±0.26a
Jianshui	28.38±4.56b	24.72±4.18ab	2.49±0.45a	1.47±0.30a	0.31±0.28a	1.94±0.28a
Kaiyuan	29.82±4.75ab	24.89±2.53ab	2.31±0.69a	1.53±0.35a	0.09±0.02b	2.01±0.39a
Luxi	29.88±3.82ab	23.59±2.67b	2.49±0.61a	1.18±0.25b	0.14±0.09b	1.93±0.39a
Mengzi	32.04±3.45a	25.68±2.78ab	2.31±0.50a	1.58±0.27a	0.13±0.06b	2.03±0.62a
Mile	32.80±	26.40±	2.35±	1.44±	0.20±	1.83±

	3.62a	3.08a	0.39a	0.32a	0.12b	0.21a
Shipin	30.81±3.77ab	26.49±3.04a	2.64±0.44a	1.57±0.33a	0.19±0.11b	2.02±0.27a
P value	0.003	0.006	0.263	0	0	0.362

3.2.5 Difference analysis of conventional chemical indicators of tobacco leaves in different counties and cities of Honghe Prefecture in 2017

From the results of table 7, it can be seen that the contents of six chemical indicators of tobacco leaves in seven counties and cities of Honghe Prefecture in 2017 were significantly different, reaching significant levels ($P < 0.05$). Specific analysis of indicators: In 2017, the total sugar and reducing sugar content of tobacco leaves in different counties and cities in Honghe Prefecture showed consistency, showing that Luxi and Mile were the highest, Jianshui, Kaiyuan, Mengzi and Shiping were the second, Gejiu was the lowest; the nicotine results showed that the size of seven counties and cities showed Kaiyuan > Mengzi > Gejiu > Jianshui, Mile and Shiping > Luxi. In 2017, the potassium content of tobacco leaves in different counties and cities in Honghe Prefecture was significantly different, which showed Shiping > Jianshui, Mile, Gejiu > Mengzi > Luxi > Kaiyuan; the chlorine content of tobacco leaves in seven counties and cities was Jianshui > Mile > Luxi, Shiping > Kaiyuan, Gejiu > Mengzi; from the results of leaf nitrogen, Gejiu and Kaiyuan had the highest content. Jianshui and Mile were the lowest.

Table 7. Difference analysis of conventional chemical indicators of tobacco leaves in different counties and cities of Honghe Prefecture in 2017 (%)

Counties (cities)	Total sugar	Reducing sugar	Nicotine	Leaf potassium	Leaf chlorine	Leaf nitrogen
Gejiu	21.77±4.97c	18.53±3.75c	2.99±0.72b	1.81±0.42b	0.21±0.12cd	2.59±0.35a
Jianshui	23.48±5.74b	19.73±4.14b	2.86±0.88c	1.78±0.57b	0.26±0.25a	2.43±0.42c
Kaiyuan	23.28±5.58b	19.53±4.11b	3.20±0.78a	1.54±0.41d	0.22±0.14cd	2.56±0.41a
Luxi	25.69±5.69a	20.73±4.02a	2.58±0.81d	1.60±0.44cd	0.24±0.20abc	2.35±0.42d
Mengzi	23.13±6.43b	19.27±4.54b	3.09±0.79ab	1.63±0.44c	0.20±0.15c	2.52±0.42ab
Mile	25.46±6.06a	20.68±4.12a	2.74±0.83c	1.74±0.50b	0.25±0.24ab	2.43±0.44c
Shipin	23.45±6.67b	19.56±4.62b	2.81±0.82c	2.01±0.56a	0.24±0.19abc	2.47±0.43bc
P value	0	0	0	0	0.010	0

4 Discussion

In tobacco cultivation, the final quality of tobacco leaves is closely related to varieties, climate, cultivation conditions and other factors. Under the influence of many factors, the chemical quality of tobacco leaves presents certain instability between years and regions. In actual production, the stability of tobacco quality has become an important factor in the stability of tobacco quality. How to maintain stability is a hot issue in tobacco cultivation. The results showed that the contents of total sugar, reducing sugar, nicotine, leaf potassium, leaf chlorine and leaf nitrogen of tobacco leaves in Honghe Prefecture for four consecutive years showed significant differences, which indicated that the chemical

quality of tobacco leaves in Honghe Prefecture was unstable and fluctuated. Some researchers analyzed the annual stability of chemical components of tobacco leaves from major producing areas in China. The results showed that the stability of tobacco leaves in Liaoning Province was the worst, and that of Yulu was the best^[13]. Zhao Lihong^[1] analyzed the chemical stability of tobacco leaves in main tobacco - producing areas of Yunnan Province, and found that there were differences in chemical stability of tobacco leaves in different tobacco - producing areas, among which Wenshan had the worst stability and Dali had the best performance, but the stability of tobacco leaves in Honghe Prefecture was not thoroughly analyzed. The interannual stability of tobacco leaf quality in Yanshan^[4], Panzhihua^[5], Deyang^[6], Fenghuang^[14], Nanyang^[15] was also reported in the literature. The results showed that the tobacco leaf in different tobacco areas had unstable problems in many chemical indexes. It can be seen that the instability of tobacco leaf quality has become a common problem. The specific investigation and analysis should be carried out in the target tobacco area to find out the instability factors so as to find the solution.

This study found that the total sugar and reducing sugar content of tobacco leaves in Honghe Prefecture decreased year by year from 2004 to 2007. These two indicators are important indicators reflecting the good quality of tobacco leaves. Too high or too low will affect the quality of tobacco leaves. How to stabilize the total sugar and reducing sugar content of Honghe tobacco leaves should be emphasized in Honghe tobacco cultivation. This study also found that the potassium content of tobacco leaves in Honghe Prefecture was low for four consecutive years. Tobacco is a potassium-loving crop. Potassium plays an important role in the growth and development of tobacco plants. The potassium content of tobacco leaves in China is generally low, but the potassium content of tobacco leaves in Honghe Prefecture is on the low side as a whole. In addition, this study confirmed that the chloride ion content in Hezhou tobacco leaves from 2014 to 2017 was at a low level, and the stability between years was very poor, which was consistent with the results of Zhang Wanru^[16] and Wang Yueneng^[4]. It can be seen that chloride ion content has become one of the main factors of chemical instability in tobacco leaves. Tobacco is a chloride sensitive crop. Tobacco leaves with high or low chloride ions will affect the quality of tobacco leaves. Too low chloride ions will lead to fragility and poor hygroscopicity of tobacco leaves. It is suggested that Honghe Prefecture should start with the regulation of soil nutrients and improvement of agronomic measures to regulate the chloride ion content of tobacco plants in a reasonable range and improve their stability.

From the comparative analysis of tobacco chemical indicators of different counties and cities in Honghe Prefecture from 2014 to 2017, it can be seen that there are significant differences in the conventional chemical indicators of tobacco leaves among seven counties and cities in 2014, 2015 and 2017, while there are significant differences in the other indicators except nicotine and

nitrogen content of tobacco leaves in 2016. It can be seen that Honghe Prefecture has significant differences in tobacco chemical indicators. Chemistry of tobacco leaves is unstable in different counties and cities. There are differences in ecological conditions such as climate and soil^[12] in different counties and cities of Honghe Prefecture, which may be the main reason for regional differences in tobacco leaf quality. Because the ecological environment can be changed by cultivation techniques in production, Honghe Prefecture can explore the cultivation techniques adapted to local conditions according to the characteristics of tobacco - growing soils and ecological environment in each county and city, reduce the differences between chemical indexes of tobacco leaves in different counties and cities, and comprehensively improve the stability of tobacco quality in Honghe Prefecture.

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