Revaluing of terminal bud Pruning on Young Rubber Trees

Xie Guishui[1, 2] Huang Yuanfang[1]

1 college of Resources and Environment, China Agricultural University, Beijing 100094, China
2 Rubber Research Institute, CATAS, Danzhou, Hainan 571737, China

Abstract

Nowadays, the measure of terminal bud pruning on young rubber tree has been become a routine method. The approach of pruning is to cut the terminal bud or whorl leaf on the top. After the bud sprouting, 3 buds were maintained to form the backbone branches. The main original purpose of this measure was as follows: (1) to reduce the height of the rubber tree and enhance the ability of resisting wind; (2) to form the crown of rubber tree as soon as possible and promote the stem growth. However, the practice showed that both these purposes could not be achieved easily, or that the result of the method was not remarkable.

On the other hand, the disadvantages of this method are obvious. For example, the timber accumulation will be reduced, and the useable area of tapping on the stem will also be lessened. Meanwhile, the irrational branch structure due to incorrect operation will add to the wind damage to the rubber tree. Furthermore, repeated top-pruning of the young rubber will accelerate aging of the tree. It is concluded that the measure of terminal bud pruning of young rubber tree is not suitable.

Key words: rubber tree; young tree; terminal bud pruning

1 Introduction

Nowadays, the measure of the terminal bud pruning on young rubber tree has been become a routine method at large by rubber planter. The way of this method is to cut the terminal bud or the whorl leaf on the top while the tree height up to 2.2-2.5 m. When the lateral buds sprout, 3 buds will be chosen to form the backbone branches ordinarily. The original intention of this pruning measure is to reduce the height of rubber tree in order to enhance the ability of resisting wind damage. Another main purpose is to form the crown of rubber tree as soon as possible so that the stem girth growth will be promoted. However, the research and long term practice have indicated that the advantage from this measure was less than its disadvantage. In another word, this method should be applied on the young rubber tree no longer.

2 Advantages of terminal bud pruning of the young rubber tree are inconspicuous

2.1 Purpose of terminal bud pruning to low the plant height is not achieved as expected

The wind damage to rubber tree is resulted from wind pressure when gale acts on the crown of a rubber tree. The size of wind pressure not only relate with the wind speed, but also with the shape and bulk of the tree (Chief editor: He Kang, Huang Zhongdao, 1987). In Chinese, there is a proverb that a person of high position is liable to be attacked. It comes from the fact that the bigger of the tree bulk, the easier to be attacked by wind. When the tree is higher, its area of accepting wind is larger, and the arm of force is also longer, so that its fatalness with wind damage is bigger. It tells its own tale that reducing the tree height is an ideal way to enhance the ability of anti-wind damage for rubber tree.

In order to reduce the tree height, terminal bud pruning on young rubber tree is considered in the first instance. In ideal imagination, the tree height growth will be controlled by means of playing down the branch position.

Existing trial result showed that it has remarkable effect on reducing tree height within 2 years after pruning the terminal bud. According to the trail result (Li Guo and Huang Shoufeng, et al., 1980), the control tree (not pruning) is higher 24 % than the pruning tree after 1 year since pruning. The trail was done on young rubber tree with clone RRIM600. When the tree was 1 year old, and the height is above 2.2 m, the terminal bud was moved off. After 1 year later, the average height of pruning tree was 2.81 m, while that of control was 3.49 m.

However, along with the tree age increasing, the difference between the pruning tree and control will be decrease gradually. After 2 years since pruning, the height of pruning tree was 5.4 m, while that of control was 5.7 m(Li Guo and Huang Shoufeng, et al., 1980). The difference between them had been decreased to 5.6%. Up to 10 years later, there was not difference between them. The height of pruning tree and control was 13.8 m and 13.7 m severally (Huang Shoufeng and Lin Weifu, et al., 1983).

It indicates that the agricultural measure is not effectual by applying terminal bud pruning to reduce the height of rubber tree, because its genus is for a tall arbor.

2.2 Purpose of terminal bud pruning of young rubber tree to promote the stem growth is also difficult to meet

The phenomena of top dominance exist in all plant. This means that the growing of terminal bud will restrain the lateral bud growth. By the way of the terminal bud pruning, the number of branches will increase. Meanwhile, the excess growth in height will be controlled in some extent, so that the leaves number of colony will increase (Wang Huatian and Sun Minggao, et al., 1997). This measure has been applied widely on fruit tree (Li Yingzhi and Zhong Xuehua, 2004) and tea plant (Li Wensheng, 1994) and some other crop, and has received ideal effect on bringing up their crown structure of a tree.

Theoretically speaking, it may be an ideal way to promote the stem girth growth of rubber tree by using the produce experience from the fruit tree and other crop for reference. It should increase the branches by means of moving off the terminal bud during its young age, and

promote forming the tree crown as soon as possible and increase the leaf area for photosynthesis, so that the growth rate of stem girth would accelerate.

However, many testing result showed that the effect is not ideal by using terminal bud pruning to promote the stem growth. For example, Li Guo et al used 2 clones of RRIM600 and Guangxi 6-68 for material, and move off the terminal bud at 3.5 m above ground after 2 years later since planting. When the lateral buds sprouted near the cut, 3 buds in different direction were maintained to form skeleton branch (three fork type). According to their trail result, the stem growth capacity of pruning tree was only 90.6% as that of control at the same year. It was 92.7% and 98.8% in the second and third year respectively since pruning (Li guo and Huang Shoufeng, et al., 1980). Up to 10 years later, the accumulative total stem girth of pruning tree was only 96.6% as that of control (Huang Shoufeng and Ling Weifu, et al., 1983).

The experiment result in seedling also confirms the conclusion from another side. The terminal bud was cut when the first leaf whorl was stable. 11 months later, the stem girth at 15 cm above ground of pruning was only 94.6% as that of control. When the pruning was done at the third leaf whorl being stable, the stem girth of pruning was just 87.4% as that of control after 7 months later (Li Shujie, 1996).

From all above results, it showed that the ideal wish was difficult to carry out by using terminal bud pruning to promote the stem girth growth. The reasons were as follow: (1) Compare to the control, more nutrient and water were consumed in the pruning tree because of more branches and leaves growing after pruning, so that it stunted the growth of stem. (2) The growing period of bud was put off 15-30 days after pruning (Li Shujie, 1996). (3) Although the quantity of branch and leaf after pruning were much more than that of control, the branch was thin and the leaf was small. Besides, their branches and leaves were denseness and overlap. Meanwhile, although the crown breadth of pruning tree after pruning was larger than that of control, its thickness of crown was less at the same time. Owing to these reason, the total area of leaves for effective photosynthesis had not difference markedly between pruning tree and control. (4) After pruning, there are many branches growing within a short period. Most of them were moved off after a period of time, so this part of nutrient was waste.

3 Disadvantages of terminal bud pruning of the young rubber tree

3.1 Reducing the quantity of timber accumulation

After terminal bud pruning, the stem would shorten owing to the branch falling to the lower position by human intention, so that the timber accumulation of stem reduced. This resulted in the economic value of stem reducing in a large extent. The similar result could be seen in many plant varieties such as chinaberry (Wang Ruihua, 1983) and poplar (Li Zhiguo and Li Dajun, 2000). It is an ordinarily thing in the timber produce.

Nowadays, rubber timber has been becoming an important byproduct for rubber planting. Along with the nature forest protection becoming more and more strength, the conflict between timber supply and require will be also more and more intensity. Therefore, the weight of rubber timber in production value will become bigger and bigger. Just about this reason, many primary countries in rubber planting have been adjusting their breeding aim. The rubber yield was no longer as one and only target or an absolute important index. The

timber accumulation was becoming an important index.

3.2 More wind damages to the rubber tree due to irrational branch structure resulting from incorrect operation

The intrinsic branch behavior of rubber tree will be changed by means of terminal bud pruning. If all the process is under control by continue pruning, the skeleton branch and all other level branches will distribute in reason and form a nice structure of tree crown. Within a range of wind power, this structure will act the function of abandoning branches to protect the stem.

However, the result will be just the opposite to what one wishes if the process is unsuitable. The top dominance is wiped off after top pruning. Most of the lateral buds on the top layer will try to be the first to sprout. The distribution of branches growing newly is often not in reason. That will result in two troubles as follow consequently: (1) a long bark with filling will form on the joint of bough. The positions of lateral branches of growing newly are near each other, and the angle between them is lessening. The shape between branches becomes “V” type. There is a long bark with filling growing on the joint of bough. When the tree is attacked by strong typhoon, the stem will be easier to split from this position. (2) The branches are denseness and the crown of trees is massiness. The positions of lateral branch are near, so that the branches and leaves cross over each other, and the crown of the tree becomes massiness. It means that the crown of pruning tree will receive bigger wind pressure than control under the same wind power.

Moreover, the number of bud to be reserved can not accord with ones wish sometimes. For example, the branch type in wish was “three forks”, but it became “two forks” shape at last owing to the supervise measure do not keep up with or other reason. This shape of tree is very easy to crack from the position of branch, so that the stem will be useless.

Therefore, if the operation of terminal bud pruning is unsuitable, the function of abandoning branches to protect the stem can not carry out. On the contrary, it will increase the degree of wind damage on rubber tree.

3.3 Less useable area for tapping on the stem

Latex collecting on rubber tree is applying the method that is cutting the bark on the stem continuously. Being straight and smooth on the collecting position is the basic assure for receiving a high yield.

The upper position on stem can apply hidden tapping (cut the bark from low to high) to collect latex. This tapping method is applied popularly on the rubber tree of longer age tapping. If the length of stem can be assured, it means that there is more usable area for tapping, so that the economic life of rubber tree will be prolonged accordingly. That will increase the economic benefic for rubber planter.

However, the pruning tree will start to branch at the height of a little more 2 m above ground. The bark near the branch position is not convenient for tapping because the geometry structure about the joint has a great variety, and the latex yield from here or nearby part is low. Meanwhile, the latex yield from branches upper the joint position is far lower than that from stem, because is can not compare to the stem both on the width and the bark thickness.

3.4 Repeated top-pruning will accelerate aging of the tree

The relation between the nutrition growth and the procreation growth in plant is both opposite and uniform. There is always either correlation or competition between them.

By using top-pruning, some of nutrition growth turns to procreation growth. The nutrition will focus on the flower bud differentiation and promote to blossom out, while the nutrition consume on body will reduce. This measure is a important technical way to increase yield and had been widely used on vegetable (Deng Fucheng, 1986), potato (Zhao Lianzhong, 1984), fruit tree (Wang Chunliang, 1990), spiceberry (Zhu Xiaodong and He Shuangling, 1999) and other crop.

On the field of rubber tree breeding, the effect was satisfied by using top-pruning continuously to induce decreasing tree height and promote blossom ahead ordinary age. The height of rubber tree would be reduced by the way of continuous pruning start from young age (Wang Zhengguo and Huang Shaoqun, 1981). Up to 3.5 years old after planting, the tree height was only 2.5 m and the breath of crown was about 5 m commonly, so that it was convenience for artificial pollination (1979).

However, the main purpose for rubber tree planting is to gain latex. Procreation growth in rubber tree will not only consume large part of nutriment matter and reduce the latex yield, but also accelerate aging of rubber tree and shorten its economic life. Therefore, except the breeding worker, the other planters of rubber tree are all wish that less procreation growth is better, and slower the mature rate is better. Of course, if the top-pruning is not many times and continuous, the impact on promote procreation can be ignored.

4 Conclusion

The top-pruning measure has been applied widely in many fields of agriculture, such as bringing up the ideal crown structure in tea plant (Wang Bailing, 1985), or sculpting in stump miniascape (Wei Tingpan, 1996), or controlling tip and promoting blossom in fruit tree (Li Yingzhi and Zhong Xuehua, 2004). It has been an important technical content of fertility culture on many crops.

However, as to the rubber tree plant industry, its main product is latex, and its byproduct is wood timber, so that the disadvantage is far more than its advantage by using top-pruning measure on young rubber tree. The main reason is that: firstly, the primary intention of this measure is to enhance its anti-wind ability and promote the stem growth, but it has been testified by fact that the result can not achieve what one wishes. Secondly, there are many obvious disadvantages by using this measure, such as reducing the timber accumulation, or lessening the useable area of tapping on the stem, and adding to the wind damage to the rubber tree by the irrational branch structure, and accelerate aging of the tree. Therefore, it is concluded that the measure of top pruning is no longer suitable to be used on young rubber tree.

5 References

Deng Fucheng. (1986). The effect of increasing production by terminal bud cutting of horsebean[J]. Bulletin of agricultural science and technology. 1986(06)

He Kang, Huang Zhongdao(editor in chief). (1987). Rubber culture in the northern part of tropical area[M]. Guangzhou: Guangdong science and technology publishing company. 1987, 130-140.

Huang Shoufeng, Lin Weifu, Fu Shiguan, et al.(1983). Tress growth of RRIM600 and impact of pruning on the crown of a rubber tree[J]. Chinese journal of tropical agriculture. 1983(04)

Li Guo, Huang Shoufeng, Tang Zhifa, et al.(1980). Experimentation of pruning and plastic on young rubber tree (brier summary on 1972-1977)[J]. Chinese journal of tropical agriculture. 1980(02)

Li Shujie. (1996). The answer of 100 questions in rubber culture[J]. Technology of tropical crop. 1996(03)

Li Wensheng. (1994). How to prune the tea plant[J]. Technology of farmer. 1994(12)

Li Yingzhi, Zhong Xuehua. (2004). The effect of top pruning and short cutting on Longan fruit tree during its early production[J]. Fujian fruits. 2004(01)

Li Zhiguo, Li Dajun. (2000). The plastic and pruning on poplar[J]. Anhui forest. 2000(04)

Studies on the inducing dwarf and promoting blossom on rubber tree[J]. tropical agricultural science and technology. 1979(01)

Wang Bailing. (1985). Test of top pruning on the seedling at young age[J]. Chinese tea. 1985(02)

Wang Chunliang. (1990). A new progenitive way of strawberry[J]. Ningxia technology of agriculture and forest. 1990(01)

Wang Huatian, Sun Minggao, Huangfu Guiyue, et al. (1997). Studies on the technology of pruning and plastic on the maidenhair tree. Forest science and technology. 1997(04)

Wang Ruihua. (1983). The trial of plastic and pruning on Chinaberry[J]. Jiangsu forest technology. 1983(04)

Wang Zhengguo, Huang Shaoqun. (1981). Studies on the inducing dwarf and promoting blossom on rubber tree[J]. Chinese journal of tropical crops. 1981(01)

Wei Tingpan. (1996). How to promote the bottom branch growth of miniascape[J]. Chinese flower and miniascape. 1996(12)

Zhao Lianzhong. (1984). There is a good effect of packing bud on potato vine[J]. Hebei agricultural technology. 1984(04).

Zhu Xiaodong, He Shuangling. (1999). Test on chemical control of young vanilla cutting root rot[J]. Yunnan tropical crop science & technology. 1999(04)