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3G Cutting: An Innovative Tool in Cucurbitaceous Crops to Boost the Production and Doubling the Income of Small Farmers in a Per Unit Area

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

3G cutting is one of the most popular and successful inter-culture operations in cucurbitaceous crops like; bottle gourd, cucumber, pumpkin, sponge gourd, bitter gourd, etc. as well as in plants like tomato, eggplant, chilli, and lady's finger for a small patch of land. Low fruit set is an emerging constraint in cucurbits, and when it does, extremely small-sized fruits develop and degrade the mother plant. This is the main problem that farmers are currently facing. This problem arises due to a rapid decrease in beneficial insects and other pollinators as a result of the haphazard use of foliar fertilizers and chemical pesticides. 3G cutting is a scientific process to get higher production from plants by increasing the number of female flowers in the plant by adopting practices like trimming and pruning of 1st and 2nd generation branches. Generally, 1G and 2G branches have more no. of male flowers than female (approximately in the ratio of 14:1) whereas this ratio is reduced to 1:2 in 3G branches. We are all known that fruits develop from female flowers, while one male flower can pollinate several female flowers. However, this does not imply that there is no need for male flowers. Male flowers are necessary for pollination. Thus, 3G cutting is the finest scientific practice for farmers to maximize the number of female flowers and fruit yield.

Keywords: Cucurbits; 3G cutting; female flower; fruit yield.

1. INTRODUCTION

Different cultural operations must be used to acquire the best results from plants in terms of growth, development, and productivity. One of them, 3G cutting, has been shown to directly enhance the plant's output capabilities. Even in a tiny plot of land, 3G cutting is a revolutionary method for enhancing the yield per plant, especially for cucurbits like cucumber, sponge gourd, bottle gourd, bitter gourd, snake gourd, pumpkin, and ridge gourd [1-3].

As we all are known to 1G, 2G, 3G, 4G, and 5G mean, figuring out the advantages of a cell phone's underlying technology is easy. The terms 1G and 2G denote the first and second generations, respectively, of wireless cellular technology. As you can anticipate, later generations are quicker and include enhanced or new functions. Based on the cell phone generating system, this technology is also used in cucurbitaceous and other vegetable crops.

The 3G system outperformed the others in terms of cutting-edge technology generation. The use of 3G cutting in agriculture can result in the highest productivity possible per unit of land area. To promote the growth of the third (tertiary) branch in any crop, excluding the first and second-generation branches is referred to as 3G [4,5]. Only one main branch, designated as the first, continues to grow after the seed germination (First-generation). If this initial branch produces a second branch, it is considered a second branch (Second-generation). Further, it is referred to as the third generation when this second-generation branch produces another branch (Third- generation).

According to the research studies, the bulk of the flowers on the first and second-generation branches are male rather than female, resulting in a relatively modest ratio of 14:1 (Male: Female) flowers in the branch, giving us the misleading impression of extensive flowering but with very little fruiting. Consequently, the majority of the female flowers are located on 3rd generation stems. Better fruit set per branch and then per plant, as a result of appropriate pollination under these circumstances, ultimately results in higher production/yield per branch or plant. The preservation of the third-generation branch should be prioritized over other branches.

2. WHY IS 3G CUTTING NEEDED?

The beneficial insects necessary for pollination are rapidly disappearing as a result of the careless application of chemical pesticides. As a result, Cucurbitaceous crops experience very poor pollination. Cucurbit includes several crops like cucumber, ridge gourd, ash gourd, bitter gourd, bottle gourd, bitter gourd, pumpkin, etc. A low fruit set is a production constraint, and when it does occur, extremely few fruits emerge that degrade in the mother plant. Most farmers around the world, including those in Nepal, are affected by this problem. To increase yield when growing cucurbits, 3G cutting is one of the most crucial cross-cultural practices to be used. When cutting 3G, the following actions should be followed. With the right maintenance and attention, the main branch that grows from the sown seed should be allowed to flourish [6-9].

Hermaphrodite plants, or those that belong to the Cucurbitaceous family, produce both male and female flowers. The quantitative relationship between male and female flowers determines how many fruits are produced. The fruit set that progressively produces more will increase as the number of female flowers increases. A quick and easy process known as 3G cutting would substantially boost its output and could be used to maintain the quantitative relationship of male-to-female flowers.

3. PURPOSES OF 3G CUTTING

Maintaining the right quantitative relationship between male and female flowers in the plant is the primary goal of 3G cutting, which also exponentially increases crop production.

4. PRINCIPLE OF 3G CUTTING

We are well aware that pistillate flowers turn into fruit. The formation of fruits is therefore ultimately dependent on pistillate flowers, albeit male flowers are also necessary. In other words, if a plant produces more pistillate blooms, we will also produce more fruits. To increase the number of pistillate flowers on a plant, 3G cutting is used. In most crops, the proportion of male and female flowers is generally unbalanced. Staminate flowers will therefore be more numerous than female flowers.

5. WHAT IS 3G CUTTING?

Third-generation cutting in any crop is simply referred to as 3G. When first (primary) and second (secondary) generation branches are removed from a plant by cutting or pinching, the third generation (tertiary) branches are encouraged to grow. One major branch, known as the first (first) generation branch, is the only one to continue growing after seed germination. The primary branch generates second-generation branches, which are further branches. Any second-generation branch that develops into another branch is known as a third-generation branch.

According to research, in the Cucurbitaceous family first and second-generation branches generate roughly 14:1 more male than female flowers on average (male: female). The result is a severely poor fruit set while giving growers the mistaken impression that major flowering is occurring. On the other hand, third-generation branches typically yield a wider variety of female flowers than male blooms. To increase output, more female flowers must be present and must be properly pollinated to set more fruits per branch and plant.

6. STEPS OF 3G CUTTING

3G cutting is an important inter-culture operation for growing cucurbitaceous crops & a very slight influence in some solanaceous, which appear easy but are sensitive in the field.

- Firstly, the main branch growing from the sown seed must be allowed to grow properly up to the height of 6-7 feet with careful care and maintenance.
- After the main branch reached a height of about 7-8 feet (gourds) or 5-6 feet (cucumber & pumpkin), 4-5 inches should be removed from the plant's growing tip.
- It promotes the formation of secondary branches after the apical portion is removed. This is because of the translocation of photosynthesized food to the secondary branch.
- After the secondary generation branch has reached a height of 2-3 feet, the upper apical portion of this branch should also be cut off, much like the previous one. This will now encourage the development of tertiary or third-generation branches.
- The third (tertiary) generation branches should be allowed to grow and bear fruit with the best fertilization and care possible. This plant may lead to heavy blossoming with female flowers.

7. ADVANTAGES OF 3G CUTTING

A recently developed technique in agriculture is called 3G cutting. Thus, these fantastic benefits have been discovered by numerous researchers that are working on this technique:

- You can enhance overall crop yield very simply without using chemical fertilizers and

the overall crop production can be raised by using this strategy alone.

- If you're a farmer who loves to practice organic farming then the 3G cutting technique is very useful for you.
- A farmer having a small land holding who can also enhance crop production. Many small land-holding farmers are prevalent in developing nations.
- Therefore, they are unable to grow crops over a vast area to make a profit. Therefore, they can use this strategy in the crops that are growing in the same field to get a higher yield.
- Increase the overall production of farmers to adopt this technology and will also increase the net profit of the farmer. It can also lead to a better quality of livelihood for rural farmers.
- Although, many urban farmers have been also utilizing this strategy as well to increase production and profit from small landholdings.
- As a result, you can increase total yield without investing extra money, except for expert labours (in the case of large farms).
- This method is used in plants to enhance fruit size and quality.
- After using 3G cutting, many farmers observed better fruit size and quality.

8. DISADVANTAGES OF 3G CUTTING

It should go without saying that there are a few drawbacks after so many benefits and getting to know them is crucial:

- Before applying 3G cutting, the farmer must have technical knowledge about this process.
- Without technical knowledge a person can also damage the crop. Hence, it may cause more harm than benefit. Thus, learning the complete process becomes very necessary.
- At the time of flowering and fruit formation the plant can be delayed as the vegetative growth occurs rapidly and also more branches are produced. So, you'll have to wait for a little before seeing the incredible outcome.
- This is not easy to practice 3G cutting on a large farm. The work may be challenging and will require proper attention and time. Hence, farmers with large land holdings can't practice this technique very easily. If labour will be hired then too, they should be skilled enough to carry out the process correctly.
- Due to pruning and trimming of branches of the crop, there may be the chance of disease and pest attack. Mainly fungal infection can occur. So, proper care and prevention should be taken.

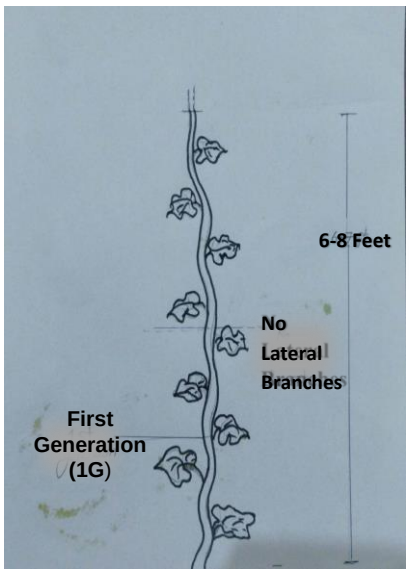

Fig. 1a. 1G cutting

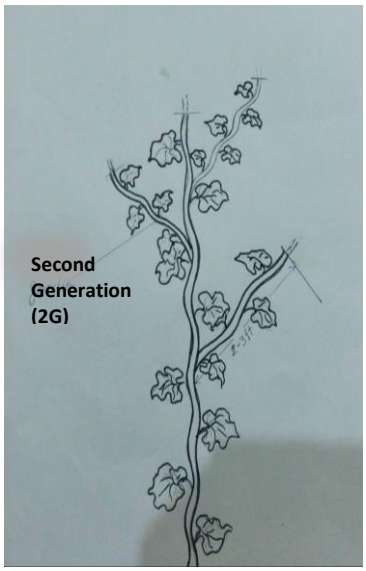

Fig 1b. 2G cutting

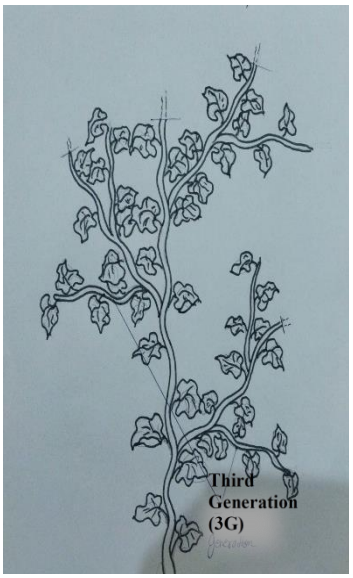

Fig. 1c. 3G cutting

Fig. 2. Performing of 1G, 2G & 3G cutting

Fig. 3&4. Fruiting after 3G cutting

9. UNIQUE FOCUS OF 3G CUTTING

- ✓ Lower 4-5 leaves of the plant do not develop (bear) any branches i.e. secondary branches.
- ✓ Cut the apical plant part to get second-generation (2G) branches at 12 leaves stage i.e. just above the 12th leaf.
- ✓ Apical portion of the plant (main branch) must be cut off when the plant height reaches 7-8 feet tall.
- ✓ Maintain appropriate soil moisture before starting to cut the tips of the branches. Do not keep dry soil during the process and also plant remains healthy and not bushy.
- ✓ To promote vegetative growth after 3G cutting, the plant requires enough sunlight. Furthermore, it assists in reducing the growth of fungi.

10. 3G CUTTING IN CUCUMBER

- ➢ Maintain healthy growth of the plant. Allow it to reach a height of 5 to 6 feet.
- ➢ Don’t prune out the growth of any side branches below the height of the first 5 leaves in the plant. After attaining this height, you can permit side branches to grow.
- ➢ When the plant attains 5 to 6 feet of height then pinch out the growing tip of the main branch.
- ➢ After this cutting 1st generation branch will promote to bear many 2G branches.
- ➢ After that 2G branch grows up to 1 to 2 feet long when it reaches the desired length then cut the tip of 2 generation branches.
- ➢ After a few days, you'll see many more 3G branches emerging. They will produce abundant female flowers, resulting in increased yield.

11. ESSENTIAL 3G CUTTING INFORMATION

A technique known as "3G cutting" is carefully pruning and clipping branches to increase the number of 3G branches bearing female flowers. 3G cutting balances the ratio of male to female flowers on the plant, increasing production. This helps in the plant's ability to produce more fruit, which increases yield [10-12].

Therefore, even after you use this method, there may be reduced fruit production because of poor pollination that occurs since there aren't enough natural pollinators. For better results, use hand pollination, or grow flowering plants near the primary plant that attracts pollinators like bees and butterflies.

12. CONCLUSION

3G cutting has enormous potential and farmers should be aware of this method to maximize their production as well as income. Adoption of such technology can increase overall crop production easily. Using this technique simply, can boost overall crop production without depending on chemical fertilizers. However, the lack of performing this technique in cucurbitaceous crops may lead to several production constraints.

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