

## “PROBLEMS IN TISSUE CULTURE OF WALNUT AND THEIR SOLUTIONS”

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### Introduction:

Walnut is an important temperate fruit crop belonging to the genus *Juglans*, which grows 20-25 there is a caste of species. It is distributed naturally in the Northern Hemisphere and it has spread till America. The entire *Juglans* species is a member of the Juglandaceae family, whose family there are about 60 species. This plant is monoecious, wind-tolerant and self-compatible. Its wood is excellent, high quality and widely acclaimed. It is exported for the manufacture of luxury furniture and wooden cases.

**Effect of walnut consumption on human health:** Heart, coronary, diabetes and nerve related problems. It is related to reducing the probability. The Plant Breeding Academy of the University of California in Walnut timing of flowering has been studied.

The analysis showed that walnuts are more likely to grow at the end of winter than in spring. Due to the high temperature and heat conditions during late winter and early spring. Early leafing in **Payne** variety and **Chandler** and **Franquette** late emergence of leaves in makes clear the difference in cooling



Walnuts are valued for their taste, health and nutritional properties. Because they are a rich source of unsaturated fatty acids, tocoferol, polyphenols and 3 phytosterols.

requirements of the varieties.

**FINALLY WHY TISSUE CULTURE IS  
REQUIRED FOR WALNUT  
PROPAGATION?**

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**Variation due to seed dispersal:** Due to the high frequency of cross-fertilization in walnut, every walnut tree is a separate species. Since many improved varieties of walnuts have been recently introduced in India. There are varieties such as lateral bearing **Chandler, Howard, Lara, Tulare** and **Chico**, hence a refinement to the genetic similarity. There is a need to develop the system. However, walnuts can be cloned using groundnut can be multiplied, But it is a time consuming process because the grafting is rigorous. Hardy walnut seeds require stratification for sprouting Used as rootstock.

**Low percentage of root formation in walnut:** Means of cutting due to poor root formation percentage of walnut it is difficult to do so. But in tissue culture, any vegetative part of the plant such as bud, root tip, leaf and internode can be used as sources of propagation. This plant part is established in a controlled environment on artificial nutrient medium using aseptic conditions. After this, the bud withers which forms a new shoot. After 3-4 shoots have germinated, they are pinched. Now, these shoots are planted on a rooting media to induce roots. After formation of roots, these seedlings are hardened in polyhouse and then transferred to open field.

**Problem of graft union girdling:** Grafting is a widely used method for propagating walnuts, but its success rate is

adversely affected by the Great-Union virus. Additionally, if the Grand-Union is buried beneath the soil, it can stimulate new roots.

**Rapid development of improved varieties:** Institutions like University of California, East Malling Research Station and Oregon State University actively work on plant breeding programs which have resulted in the release of amazing varieties. In the walnut breeding program, lateral fruiting walnut varieties such as Chandler and Howdy have been developed. The Central Institute of Temperate Horticulture (CITH) of India has also released side-fruited varieties of walnut.

For their clonal and disease free propagation, tissue culture services need to be standardized.

#### PROBLEMS IN TISSUE CULTURE OF WALNUT:

Despite having so many advantages of tissue culture, walnut is still a difficult crop to propagate. Although it is difficult to establish all woody plants from tissue culture, walnut shows very high recalcitrance due to the following reasons:

- 1. High Nitrogen Requirements:** Almost every fruit crop is propagated on Murashige and Scrooge media as it provides optimum nutrition to every crop. Whereas for bushy plants, woody plant media is used for successful propagation. But when walnut seedlings are planted on these media, they show better growth.

## 2. **Hollow Pith and Asim Kitarushorn:**

Walnut seedlings are hollow which is likely to result in failure of efficient deworming. Before planting on the media, the cuttings are disinfected using various chemicals. In tissue culture of walnut, scientists have reported the problem of bacterial contamination even after one month of planting.

**3. Emission of Phenol:** Phenol emission when applied to media is a common process seen in woody perennials. Due to this the media and bud turn brown. These phenols form a layer between the bud and the base of the media which restricts the absorption of nutrients and thus causes wilting of the bud.

## **SOLUTION TO WALNUT TISSUE CULTURE PROBLEMS:**

Over the past decade, scientists have successfully established walnuts using tissue culture. Additionally, a success rate of 72% has been reported in walnut micro grafting into the walnut rootstock in which chandlers were used as scions. After studying the methods chosen by walnut scientists, the following solutions have been listed that can solve the problems mentioned above.

**1. Embryo culture:** Embryo culture is a popular technique for the production of disease free plants in which embryos are planted on germination medium. First of

all the seeds are washed under running tap water. Then, the seeds are disinfected in a sterile environment using a chemical. After that, the embryo is taken from the seed with the help of a sterilized blade and planted on the media. This process solves the problems of phenol emissions and bacterial contamination but like seedling plants, the plants produced from this process can suffer from diseases.

**2. DKW Media usage:** D.K.W. The media was invented by Driver and Ku Niyuki specifically for nut tissue culture. Compared to murashigae and school media, it contains acetic nitrates. It also prevents zinc and iron deficiency as it contains high concentration of zinc and iron salts.

**3. Use of juvenile sieves:** Use of juvenile and smaller sieves can reduce the rate of contamination. In smaller plants, the amount of phenol is less due to which phenol emissions will also be minimal. Whereas in mature sprouts, hollow medullary structure starts forming and the amount of phenol also increases.

**4. Use of Antioxidants:** Before disinfecting the blades, they can be soaked in antioxidants such as activated charcoal and polyvinyl pyrrolidine. It absorbs phenol deposited on the cut part. Antioxidants can also be added to the media which can

prevent the formation of a layer between the bud and the media.

## CONCLUSION:

Tissue propagation of walnut through tissue culture is very useful for maintaining walnut characteristics and propagating clones with valuable genotypes. The major motivation behind developing micropropagation systems for walnut is to develop and propagate rootstock and elite trees for commercial and research applications.

Tissue culture can also shorten the reproductive process. This can be done by implementing embryo culture. The most important thing in micropropagation is to standardize the disinfection process and modify the media according to the nutrient deficiencies in the crop. As developments in biotechnology have also been applied to walnut improvement, micropropagation is becoming an important tool in walnut development and production.

