International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

A Review on Asexual Reproduction System in Plants

K Ramesh
Department of Electrical& Electronics Engineering,
Bapatla Engineering College
Bapatla, India

Abstract: - Artificial propagation is the process of growing plants artificially. Artificial propagation is a type of vegetative reproduction in which breeding or growing plants is done using parts of the parent plants like stems, roots, and leaves. In the method of cutting, a new stem grows from the branch fixed into the soil. This new stem grows into another plant. If we cut small shoots or bugs from the plant stem and attach the cut portion to the plant, this process is known as grafting. If we bend one of its lower branches of the plant to the ground and cover it with soil known as mound layering, that leads to the development of new roots. For cashews we remove the bark of a branch from one of his plants and then cover the area with moss or cotton bandage and if water it daily, this method is called aerial layering.In multicellular organisms cell division just gives us more cells, we don't get brand-new individuals and therefore this will not work as a reproduction method for multicellular organisms. And therefore, in this paper the focus is on the reproductive methods for multicellular organisms. Specifically budding, fragmentation and spore formation.

Keywords: Cutting, Stem, Artificial vegetation, Rooting, Commercial.

1. Introduction

Plants reproduce by vegetative asexual and sexual processes. Vegetative reproduction includes all those processes of propagation in which a part of the plant's body is separated from the parent and gives rise to a new individual without any obvious changes in the protoplast. Regeneration of new plants from parts of vegetative organs is called vegetative reproduction or vegetative propagation. In artificial vegetative propagation abortion is detached from the body of the mother plant and is then grown independently [1]. Artificial propagation is usually done for quick production of new plants and to retain the qualities of the mother plant. This is usually carried out by three ways cutting layering and growing [2]. Cutting is the most common method of vegetative propagation practiced by gardeners all over the world. A portion of roots stem or leaf known as cutting is taken and rooted in the soil which develops into a new plant. Stem cuttings the most suitable for vegetative propagation as they readily establish themselves into independent plants by forming adventitious roots of the lower nodes and shoots from the axillary buds above the soil [3]. Sugarcane roses grapes tapioca coleus bougainvillea carnations and several other plants are largely propagated by stem cuttings. The length and the diameter of the cutting. age of the parent plant and the season are reporting in propagation by stem cuttings. The rooting medium can be soil sand vermiculite or any other substance. The selection of rooting medium is done based on its easiness for planting subsequent removal of rooted cuttings [4]. And its capacity to hold sufficient moisture and variation. Stem cuttings which are 10 to 15 centimetres long can be taken from any part the main stem all its branches. When cuttings are taken from the current yield growth which are often green they are called softwood cuttings. While the cuttings which are taken from the older parts the stem are called hardwood cuttings[5]. In general softwood cuttings root better than hardwood cuttings. Care should be taken to put the morphologically lower side of the cutting in the soil. Roots are formed the lower end of the

cutting and rooting is better if lazin buds are also present on the cutting. Root cuttings of lemon tamarind etc when put into moist soil sprout forming new roots and shoots [6]. Sometimes cuttings of many plants do not readily form roots. In such cases the second way of artificial propagation that is layering is practiced to induce rooting. By layering roots and induced and branches still attached to the parent plant. layering is commonly brassed in many fruit trees and ornamental plants whose cuttings do not easily root. The two important methods of layering a mound labouring and air layering [7]. The technique of mound layering is practiced in Jasmine, strawberry, apple etc. The lower branch of the plant is bent down close to the ground and covered with moist soil in such a way that its growing tip remains about the soil surface. This bent branch is called a layer [8].

2. Rooting the stem

After a few days the covered portion of the stem usually produces advantageous roots. The rooted branch is then cut off from the parent plant and grown as an independent plant. The formation of advantageous roots in a layer can be hastened by injuring the layer by tonguing rigging or notching. Entangling an oblique a bird's cut is made on the stem in wringing a complete ring of bark about two centimetres wide is removed from the stem whereas in notching a V-shaped cut is given somewhere through the middle of the stem[9]. Err layering technique also known as GUT is usually employed in those plants where stem branches cannot be bent to the ground. Pomegranate, orange, guava, lychee etc are the examples of such plants. The stem is girdled that is ring of bark tissue is removed or slit and an upward angle and then covered with moist moss or cotton and wrapped with a polythene bandage to prevent drying[10]. In drier climate an earthen port with a hole at the bottom is hand over the bandage in a convenient position and the two were connected by soft cotton cord. The pot is then filled with water. Water when trickles down the cord keeps the bandage constantly moist. Oxen's may be applied to the girdle region to promote the root formation. Adventitious roots are formed above the girdle portion [11].

After rooting the stem is cut off below the girdle portion and planted in the soil. Before planting leaves are usually removed from the stem to prevent transpiration. The third way of actual propagation is grafting. It is the process of joining together parts of two different plants in such a manner that they live as one plum [12]. Grafting of plants is a widely used technique in horticulture to multiply the desired genotypes in mango citrus apple pear guava among others. A portion of the plant is inserted into another plant of the same species or a compatible plant of different species or even genera[13]. Off the two plants the one rooted in the soil is known as stalked. And the other grafted bonnet has sired. When the cambium of the stock blood comes into physical contact with the cambium of the tsiyon both form new xylem and phloem simultaneously. Consequently, the stock inside become United and grow as one plant. It is the scien which largely determines the type of plant one gets after grafting [14].

3. Stock Process

Although the stock may also have some influence. Before grafting stock or sign or both are dipped in an oxidant solution this promotes in early union. The two main types of drafting a scientist and bud grafting and thigh and grafting the stock may be only a root or a stump and sighin maybe a small chute bearing one or more buds[15]. Syan grafting is used to produce composite plants of economic benefits. The tsiyon is obtained from a plant with superior

characters while the stock is derived from a plant resistant to diseases and pests inefficient in absorption of water and minerals. sorry engrafting is further done in three ways with down drafting wedge drafting and crown drafting [16]. In the first type that is whip or town drafting the stock inside almost off the same diameters of 1 to 1.5 centimetres are given oblique cuts of 5 to 8 centimetres long followed by a notch desire. The knotch is made in such a way that it exactly fits into the stock. The tsiyon is then inserted into the stock and tied firmly. All buds are removed from the stock but retained on the side[17]. In the second type of sign grafting that is wedge crafting the stock inside are of nearly the same diameter. A V-shaped notch is made in the stock while the sign is cut like a wedge. The Scion is then inserted into the stock and the two are tied firmly. In crown grafting which is the third type of sign crafting the diameter of the stock is several times greater than that of the scion[18].

Thus many signs can be grafted on a single stock. The lower ends of the science are cut into long wedges and are inserted into the cuts made on the stock. They are then tied firmly and the wound is sealed with grafting wax[19]. The second type of grafting is bud grafting. In this type the sign consists of only a single bud accompanied with a portion of the living tissue. a t-shaped incision is made in the bark of the stock. the bark is then gently raised on edges and the sign is inserted into the incision. It is then firmly fastened with strings. The bad germinates after some time and becomes a part of the new plant. Roses, peaches and some other fruit trees are propagated by using blood grafting. Tissue culture techniques are now being used for effective vegetative propagation of several horticultural and agricultural crops [20]. These techniques of propagation which involve cell tissue and organ culture are collectively called micro propagation [21].

4. Technology Utilization

In recent years the technique of tissue culture is being increasingly employed to raise large number of plantlets from a small tissue[22]. The advantage of this over the conventional techniques that in a relatively short time and space. Large number of plants can be produced. For micropropagation axillary buds shoot up isis or any other plant part can be used as an ex plant. Virus-free plants can be produced if shoot apical meristems off about 0.25 millimetres long with one or two leaf primordia are inoculated[23]. Explants properly sterilized when collected from the field. Multiple shoots can be obtained by inducing callous. Glance produced and culture are carefully transferred to the soil. They are planted first in vermiculite and kept under high humidity for 10 to 15 days[24]. Then gradually taken to the greenhouse and can be transferred to the soil after four to six weeks. Direct regeneration of shoots can be achieved from the explant without the intervening stage of callus tissue [25]. Any explant shoot Kaka lead on hyper Cottle's etc can be made to differentiate a shoot pods which can be made to root on a rooting medium thereby producing the whole plant. tissue culture techniques are being commercially used a micro propagation of orchids carnation gladiolus chrysanthemum and many other ornamental plants [26]. This technique is also useful in producing healthy plants in several important crops like potato, tapioca, and sugar cane. Thus vegetative propagation is a rapid easier less expensive method of multiplying plants which have poor seed viability a prolonged seed dormancy [27]. It also makes possible the propagation of plants like banana seedless grapes oranges rose etc that applause the capacity to produce seeds through sexual reproduction [28].

Glantz raised through vegetative propagation are the exact genetic copies of the parent showing in characters. Such a population of genetically identical plants derived from an individual is called a clone [29]. Artificial vegetative propagation provides excellent methods of propagation of desirable varieties of economically important plants with least attention and in the shortest time. Yield of fruits can be increased by grafting high yielding varieties stocks of the varieties which are low yield but are better adapted to a particular region. Micro propagation is useful in raising disease-free plants. However vegetative propagation requires technical expertise. Since vegetative propagated plants do not have tap roots such plants are easily uprooted in storms [30]. Besides it does not involve meiosis and fusion of gametes urns this process is not helpful developing new varieties. In spite of a few drawbacks vegetative propagation is a widely used technique in horticulture which helps to develop desirable varieties fruits ours and crops of great economic value [31].

5. **Reproduction in multicellular organisms**:

when a unicellular organism undergoes cell division or basically fission, we get more cells and as a result we get brand-new individual unicellular organisms and therefore this is a method of reproduction for them. However, in multicellular organisms cell division just gives us more cells, we don't get brand-new individuals and therefore this will not work as a reproduction method for multicellular organisms. And therefore, in this paper the authors focus on the reproductive methods for multicellular organisms [32]. Specifically budding, fragmentation and spore formation.

Let's start with budding with an example. To understand this, take an example of a sea creature called hydra this is what it looks like under a microscope. When this sea creature hydra which is a multicellular organism, once it starts what months it is mature that is it's ready for reproduction, we will see a tiny outgrowth from a particular part of its body [33]. This outgrowth is what we call a bud. This process is called budding. As time passes by, we see that it starts growing into a tiny new baby Hydra again. And then eventually this keeps on growing and growing and once it becomes big enough it gets detached from the parent body and finally we have a new Hydra so this is how budding happens.

Now an important thing to note is as this baby Hydra grows, we will see it's going to look the same as its father or its mother. There's no gender over. Here we just call it his parent. So, the offspring is going to look exactly like the parent as this is an asexual reproduction [34]. There is no DNA mixing like in sexual reproduction since the DNA is going to be the same. So, in asexual reproduction the off springs look like clones of their parents. Remember that anyways some unicellular organisms can also undergo budding. If we take the example of yeast then we see yeast also when it matures and it's ready to reproduce it grows a small bud and then that bud separates out and we get a new individual. We may think that it isn't budding the same thing as fission. Even in fission, cell division is happening even this looks like cell division buy there's a big difference [35]. When cell division happens that is when fission happens one cell splits into two new off springs but over here that's not happening.

we see a new offspring is growing from the parent and then it separates out. So, this is the original parent itself and this is the offspring. But if this was fission when fission happens then that original cell itself divides into two new offsprings and that original parent is no longer there. Now brings us to the next type of reproduction called fragmentation.

let's take an example of Spiro Gera. Spiro Gera is basically a green alga. When Spiro Gera matures and it's ready to reproduce, it basically just splits into many pieces and that's the reason it's called fragmentation. Basically, Spiro Gayla splits into many fragments and then each of this

fragment starts growing the rest of its body and that is the thing about Spiro Gera. It starts growing the rest of its body. by the way this process of re growing the entire body or regrowing parts of the body is often called regeneration and so in this type of reproduction when the organism matures they just fragment themselves into tiny pieces and then the each piece regenerates to grow its entire body [36]. There are other wonderful creatures that can do the same thing.

another famous example which can do this is planaria. it's a type of flat worm. When planaria matures it just sheds off its tail. this part and then the two halves grow, regenerate the rest of their body and then now we have two planaria. Another famous example is starfish. Even that can undergo this kind of asexual reproduction. When it matures it would just get rid of one of its arms and then the original starfish will regrow the arm and that arm will start regrowing the entire starfish and that's how we now have a new offspring. Now another thing about this is even if they didn't fragment all by themselves but if some external forces chop them into pieces. Let's say for example we, humans go and chop them into tiny pieces even in that case we will find that each piece will regenerate and grow individual bodies . Some Australian fishermen discovered this the hard way turns out that their local water bodies were infested with starfishes [37]. So, they decided to just take some individual starfish and chop it off and throw it back into the ocean. They thought they had killed it. . next each of those pieces started regrowing and the population of the starfish exploded. So even if we chop them into tiny pieces, they can still regenerate.

Now one thing to remember over here is even though some organisms can regenerate, that's not their preferred method of reproduction. For example even in the case of Hydra if we chop them up then each piece can regenerate into new individuals, however Hydra doesn't do that all by itself and it's for that reason we won't say that Hydra reproduces by regeneration or this particular method of fragmentation and regeneration [38]. The second thing to remember is that regeneration itself cannot be termed as reproduction and here's the reason why in some cases like a lizard, if we chop off its tail let's say the tail comes off then this lizard can regenerate a new tail so this is regeneration but this tail cannot regenerate the entire body. So, in this case regeneration is happening but this is not reproduction. We're not getting new individual over here. so in general we will not say regeneration is the same thing as a reproduction. We will say if animals or organisms prefer to fragment themselves or by themselves when they mature and then if each one can regenerate into new individual beings whom they then will say it's reproduction.

Lastly this brings us to spore formation. The famous example for this is a fungus called bread mould. If we take a piece of bread and just leave it outside and if its moist we see a lot of fungus growing on that. And the technical name for this is called the Rhizopus. The rising part is called a high fee . The top part of this blob-like structure is the reproductive part and it's called sporangia . Spores are kind of seeds that they can grow into new Rhizopus [39]. But they're not seeds. We call them as spores. They have very thick walls to protect them and so when this bread mould matures this sporangia will just release those spores into the air and then when the spores find a moist surface, they will regrow and that's how reproduction happens. Over here this is basically why moist bread will grow a fungus very fast.

6. Conclusion

So, to conclude, in budding what happens is that bud starts growing into a new individual and eventually when it's big enough it splits from its parent and we have a new offspring. In fragmentation, the organisms just fragment themselves and then each fragment grows into a new part and this process is called regeneration. And even if they get chopped up externally artificially by some environmental means even those fragments can still regrow. But not all regeneration is the same thing as a reproduction as we saw in the example of the lizard. And finally in spore formation the famous example of bread mould. When this thing matures lots of spores are released into the air and when the spores get a moist surface this each of them can start growing into a new bread mould.

The recent technology penetrates in a disciplined areas for getting desired responses. Here in this article introduce artificial propagation is a type of vegetative reproduction in which breeding or growing plants is done using parts of the parent plants like stems, roots, and leaves. By utilization the propagation of plants under different circumstance in real time monitoring by cut small shoots or bugs from the plant stem and attach the cut portion to the plant, this process is known as grafting. The cut portion of the parent plant is called cyan and the fixed plant with its roots is called stock. If we bend one of its lower branches of the plant to the ground and cover it with soil known as mound layering, that leads to the development of new roots. By incorporating the technology that propagation commercial crops cultivation increase.

References

1. Kershaw, K. A., and J. W. Millbank. "Isidia as vegetative propagules in Peltigera aphthosa var. variolosa (Massal.) Thoms." *The Lichenologist* 4.3 (1970): 214-217.
2. Leakey, Roger RB. "Physiology of vegetative reproduction." Academic Press, 2004. 1655-1668.
3. Swingle, Charles F. "Regeneration and vegetative propagation." *The Botanical Review* 6.7 (1940): 301-355.
4. Scarcelli, Nora, et al. "Farmers' use of wild relative and sexual reproduction in a vegetatively propagated crop. The case of yam in Benin." *Molecular ecology* 15.9 (2006): 2421-2431.
5. Birget, Philip LG, et al. "Phenotypic plasticity in reproductive effort: malaria parasites respond to resource availability." *Proceedings of the Royal Society B: Biological Sciences* 284.1860 (2017): 20171229.
6. Bonga, J. M. "Vegetative propagation in relation to juvenility, maturity, and rejuvenation." *Tissue culture in forestry*. Springer, Dordrecht, 1982. 387-412.
7. McKey, Doyle, et al. "The evolutionary ecology of clonally propagated domesticated plants." *New Phytologist* 186.2 (2010): 318-332.
8. Beyl, Caula A., and Robert N. Trigiano, eds. *Plant propagation concepts and laboratory exercises*. CRC press, 2016.
9. Priestley, Joseph Hubert, and Charles F. Swingle. *Vegetative propagation from the standpoint of plant anatomy*. US Department of Agriculture, 1929.
10. Schaefer, Benjamin M., et al. "The bicuspid aortic valve: an integrated phenotypic classification of leaflet morphology and aortic root shape." *Heart* 94.12 (2008): 1634-1638.
11. Hussey, G. "The application of tissue culture to the vegetative propagation of plants." *Science Progress (1933-)* (1978): 185-208.
12. Snow, Allison A., and Dennis F. Whigham. "Costs of flower and fruit production in Tipularia discolor (Orchidaceae)." *Ecology* 70.5 (1989): 1286-1293.
13. Zotz, Gerhard. "Vegetative propagation in an epiphytic orchid occurrence and ecological relevance." *Ecotropica* 5.1 (1999): 65-68.
14. Libby, W. J. "The use of vegetative propagules in forest genetics and tree improvement." *NZJ For. Sci* 4.2 (1974): 440-447.
15. Bonga, J. M. "Vegetative propagation in relation to juvenility, maturity, and rejuvenation." *Tissue culture in forestry*. Springer, Dordrecht, 1982. 387-412.
16. Crutsinger, Gregory M., et al. "Disparate effects of plant genotypic diversity on foliage and litter arthropod communities." *Oecologia* 158.1 (2008): 65-75.
17. Frankham, Richard. "Conservation biology: ecosystem recovery enhanced by genotypic diversity." *Heredity* 95.3 (2005): 183.
18. Reusch, Thorsten BH, and Christoffer Boström. "Widespread genetic mosaicism in the marine angiosperm Zostera marina is correlated with clonal reproduction." *Evolutionary Ecology* 25.4 (2011): 899-913.

19.Greenwood, Michael S., G. Sam Foster, and Henry V. Amerson. "Vegetative propagation of southern pines." *Forest regeneration manual*. Springer, Dordrecht, 1991. 75-86.

20.Forbes, Jim C., James C. Forbes, and Drennan Watson. *Plants in agriculture*. Cambridge University Press, 1992.

21.Hickey, Michael, and Clive King. *The Cambridge illustrated glossary of botanical terms*. Cambridge University Press, 2000.

22. Koning, Ross. "Plant form: an illustrated guide to flowering plant morphology." *The American Biology Teacher* 71.5 (2009): 311-312.

23. Pate, J. S., and K. W. Dixon. "Tuberous, cormous and bulbous plants: biology of an adaptive strategy in Western Australia.,(University of Western Australia Press: Perth)." (1982).

24. Oliver, Chadwick Dearing. "Forest development in North America following major disturbances." *Forest ecology and management* 3 (1980): 153-168.

25.Roest, S., and G. S. Bokelmann. "Vegetative propagation of Chrysanthemum morifolium Ram. in vitro." *Scientia Horticulturae* 3.4 (1975): 317-330.

26.Spillane, Charles, Mark D. Curtis, and Ueli Grossniklaus. "Apomixis technology development—virgin births in farmers' fields?." *Nature biotechnology* 22.6 (2004): 687-691.

27.Ofori, D. A., et al. "Vegetative propagation of Milicia excelsa by leafy stem cuttings: effects of auxin concentration, leaf area and rooting medium." *Forest Ecology and Management* 84.1-3 (1996): 39-48.

28. Lewis, William J., and DMcE Alexander. *Grafting and budding: A practical guide for fruit and nut plants and ornamentals*. Landlinks Press, 2008.

29. Beetle, Leaf. "Purdue Extension and the Purdue Master Gardener Program: Resources for Home Gardeners."

30. Maini, J. S., and K. W. Horton. "Vegetative propagation of Populus spp.: I. Influence of temperature on formation and initial growth of aspen suckers." *Canadian Journal of Botany* 44.9 (1966): 1183-1189.

31. Reilly, K. A. T. H. R. Y. N., and Jenny Washer. "Vegetative propagation of radiata pine by tissue culture: plantlet formation from embryonic tissue." *NZJ For Sci* 7.2 (1977): 199-206.

32. Wolfram, S. 1993. *Mathematica. A System for Doing Mathematics by Computer*. Addison-Wesley, Reading, Mass.

33.Uyenoyama, M.K. & Bengtsson, B.O. 1979. Towards a genetic theory for the evolution of the sex ratio. *Genetics* **93**: 721 736.

34.Uyenoyama, M.K. 1985. On the evolution of parthenogenesis. II. Inbreeding and the cost of meiosis. *Evolution* **39**: 1194 1206.

35.Ronsheim, M.L. 1992. *The relative advantages of sexual and asexual reproduction in* Allium vineale. PhD Thesis. Duke University.

36.Rispe, C., Pierre, J.-S., Simon, J.-C., Gouyon, P.H. 1998. Models of sexual and asexual coexistence in aphids based on constraints. *J. Evol. Biol.* **11**: 685 701.DOI: 10.1007/s000360050113.

37. Richens, R.H. 1947. Biological flora of the British Isles. *Allium vineale* L. *J. Ecol.* **34**: 209 226.

38.Pessino, S.C., Ortiz, J.P.A., Hayward, M.D., Quarin, C.L. 1999. The molecular genetics of gametophytic apomixis. *Hereditas* **130**: 1 11.

39.Mogie, M. 1992. *The Evolution of Asexual Reproduction in Plants*. Chapman & Hall, London.

40.Maynard Smith, J. 1986. Contemplating life without sex. *Nature* **324**: 300 301.