Effect of auxin and cytokinin on grafting and growth of sapling of guava (*Psidium guajava* L.)

Abstract :

The experiment was conducted to study the effect of auxin and cytokinin on grafting and growth of sapling of guava(Psidium guajava L.) at department of Horticulture, College of Agriculture, ummedganj, KOTA, KVK Modal nursery Agriculture university Kota during the year of 2020-21.In the investigation, L-49 cultivar of guava (*Psidium guajava* L.) was selected as mother plant for obtaining scion bud.The foliar spray of NAA and BA (50 and 25ppm each) either on rootstock or/and scion branch was applied 10 days prior to grafting. The most responsive treatments was foliar spray on rootstocks with BA at 25ppm concentration. Rootstocks treated with BA (25ppm) resulted in length of scion shoot after grafting (16.63cm), diameter of sprouted scion (2.80cm), diameter of rootstocks (3.41 cm), number of leaves(20.83) , leaf area (24.76cm^2), number of lateral shoot (7.89) as compared to others treatments.

Keywords : Guava(Pidium guajava), grafting, plant growth regulators(NAA,BA)

Introduction :

Guava (*Psidium guajava* L.)ispopularly known as apple of tropic and is native to the tropical America stretching from Mexico to Peru. Although, it is native to tropical America, widely distributed throughout the tropical and subtropical region of the India like Bihar, Uttar Pradesh, Maharashtra, Karnataka, Orissa, West Bengal, Andhra Pradesh and Rajasthan etc. Guava belongs to family Myrtaceae and has recognition of being the most widely cultivated species of his family. It is fourth most important fruit crops in area as well as production after mango, banana and citrus. It has been culture from ancient period is commonly known as poor's apple.

Recently, the technique of wedge grafting in guava is developed at Central Institute of Sub-tropical Horticulture ,Lukhnow (Singh et. al. 2007) . Wedge grafting technique has potential of multiplying guava plants rapidly throughtout the year even in extreme

climate condition such as severe cold. The plant growth regulators applied at the time of grafting as and pretreatment of rootstock and scion resulted in early callus formation and graft union (Kannan and Rao,1964). Likewise Kako et al . (2012) suggested that various auxin had significant effect on budding and grafting in fruit crop by effecting xylem and phloem differentiation and lignifications process which is considered a very important factor in formation of a strong unit area in grafting and budding process. Auxin, which play a role in increases callus proliferation and vascular differentiation in graft union (Moore,1983). The Cytokinin is another plant hormone, which is moves acropetally, and involved in cell division. Kose and Guleryuz (2006) reported that Kinetin and benzyl adenine (BA) applied to the surfaces of grape graft promoted initiation and proliferation of callus.However very little or no. of systematic research has been conducted on this aspect in agro-climatic condition of *Hadoti*region of Kota division, Rajasthan. Keeping in this view an experiment entitled "Effect of auxin and cytokinin on Grafting and Growth of Sapling in Guava (*Psidium guajava* L.)" was conducted at Krishi Vigyan Kendra, under the supervision of Department of Horticulture, College of Agriculture, Ummedganj.

Material and methods : The experiment was conducted at department of Horticulture, College of Agriculture, ummedganj, KOTA, KVK Modal nursery Agriculture university Kota. In order to achieve the objectives of this investigation, experiments were laid out in factorial completely randomized design (CRD). Under this experiment, The Guava seedling were raised at Model nursery, Krishi Vigyan Kendra, Borkhera, Kota for rootstock purposes. The seedling of 6 to 8 month old having diameter of 0.5 to 1 cm were selected for experimentation. During selection of rootstock , it was considered that selected rootstock were of uniform diameter and height , free from the insect - pest and disesases. The scion shoot were collected from the mother orchard of guava variety Luckhnow-49 (sardar guava) planted at Model nursery of Krishi Vigyan Kendra, Borkhera, Kota . About 3-4 months old with 3-4 healthy buds of 0.5-1.0cm diameter scion shoot of 15-20 cm long with 3-4 healthy buds were selected for grafting in reserchexperinment.The treatments were replicated thrice.

Plant growth regulators : The aqueous solution of different concetrations of NAA(50ppm) and BA(25ppm) was sprayed by hand sprayer before 10 days before on

the experinmental seedling rootstocks and scion stick of mother plants during the month of February, 2020.

Observations : The data were recorded from all the five plants in each replications,tagged for different treatments. The following obsevations were recorded during the experimentation : length of scion shoot (cm) after grafting, diameter of sprouted scion(cm), diameter of rootstocks(cm), number of leaves , maximum leaf area(cm^2), number of lateral shoot.

Grafting operations : Wedge grafting method was adopted**.** After selection of rootstock and scion ,the rootstock were planted in nursery bed according to the layout of experinment i.e. 30 rootstock in each bed, 10 days prior to actual grafting process.There after on the day of grafting the rootstock were headed back by retaining 15-20 cm long stem above the soil level.The beheaded rootstock were split to about 4.0 to 4.5 cm deep through the centre of the stem with sharp, clean sterilized grafting knife. A wedge shaped cut from the both side of 4 to 4.5 cm long was made on the lower node of selected scion shoot. The scion stick was then inserted into the split of the rootstock and pressed properly so that cambium tissues of the rootstock and scion came in contact with each other. During inserting of scion on rootstock that care was excersized to match the cambium layer of the stock and scion .The union was then tied with the help of 200 gauge stretchable polythene strip of 1.5 cm wide and 40 cm long. Immediately after grafting, the grafts were covered by 25×10 cm white polythene bags . The scion sprouting was started after 10-12 days of grafting .The polythene cap was removed after 25 days in the evening hours.

Result and discussion

1. **Length of scion shoot:**

The data on mean length scion shoot under the influence of plant growth regulators at are presented in Table 2. There is significant difference observed among the treatments

with respect to length of sprouted scion.The data on length of sprouted scion was recorded periodically i.e. 30, 45, 60, 75, 90,105 and 120 days after grafting. The mean maximum length (16.49 cm) of scion shoot was recorded at P_4 treatment BA 25 ppm followed by (16.63 cm) at P_3 treatment BA 25 ppmand 15.50cm at P_2 treatment NAA 50ppm.The mean minimum length (13.19 cm) of scion shoot was recorded at P_0 treatment (control) after 120 days ofgrafting.With the confirmation finding results given by Yashwanti et. al. (2008) which in all the concentration of BA significantly influenced the length of sprouted scion in the budded plants. BA being a kind of cytokinin might be contributed in growth of auxillary shoot. Kumar et al. (2005) in bael obtained that BA was found to promote rapid scion shoot growth because physiologically cytokinin promotes lateral bud development and reduce apical dominance.

2.**Diameter of scion shoot:**

The data on mean length scion shoot under the influence of plant growth regulators at are presented in Table 2. There is significant difference observed among the treatments with respect to length of sprouted scion.The data on diameter of scion shoot was recorded periodically i.e. 30, 45, 60, 75, 90,105 and 120 days after grafting. The mean maximum diameter (2.80 cm) of scion shoot was recorded at P_4 treatment BA 25ppmand the mean minimum diameter (2.12cm) of scion shoot was recorded at P_0 treatment (control) after 120 days ofgrafting.Similarly , results were recorded by Singh *et al.* (2008) also noticed maximum diameter of sprouted scion in aonla when budding was performed earlier in the month of May as compared to June.

3.Diameter of rootstocks:

The data on mean diameter of rootstock under the influence of plant growth regulators at are presented in Table 2. There is significant difference observed among the treatments with respect to diameter of rootstocks.The data on diameter of rootstocks was recorded periodically i.e. 30, 45, 60, 75, 90,105 and 120 days after grafting. The mean maximum diameter (3.41 cm) ofrootstocks was recorded at P_4 treatment BA 25ppmand the mean minimum diameter (2.11cm) of rootstocks was recorded at P_0 treatment (control) after 120 days ofgrafting.This may be explained by the fact that cytokinin promote rapid cell division and expansion which leads to greater diameter of

the scion shoot in the treated root-stocks. These finding can be supported by the results of Tripathi and Kumar (2004) in Bael with different budding periods.

Table 1. Effect of foliar spray of NAA, BA on length of scion shoot, diameter of rootstocks, diameter of scion shoot.

Treatment	length of scion shoot	Diameter of rootstock	Diameter of scion shoot
Water(control) (P_0)	13.19	2.11	2.12
Spray of NAA 50ppm on rootstock (P_1)	14.97	2.58	2.18
Spray of NAA 50ppm on scion(P_2)	15.50	2.32	2.38
Spray of BA25ppm on rootstock (P_3)	16.24	3.41	2.48
Spray of BA 25ppm on scion(P_4)	16.49	3.02	2.80

5.Number of leaves and leaf area : The data of plant growth regulators on number of leaves are indicated in Table 3.The data on number of leaves was recorded periodically i.e. 30, 45, 60, 75, 90,105 and 120 days after grafting. The mean maximum leaves (21.63) was recorded at P_3 treatmentfollowed by (20.83) at P_4 treatment. The mean minimum leaves (11.27) was recorded at P_0 treatment (control) after 120 days ofgrafting.The data presented in Table 4. on graft leaf area as affected by plant growthregulators treatments. A perusal of the data reveal that the plant growth regulators NAA and BA treatment effect as resulted in significant variation on graft leaf area.From the data, it was observed that mean maximum leaf area was 24.76cm^2 as P_4treatment (BA25ppm) and mean minimum graft leaf area was 12.86$cm^2$$P_0$ treatment (control).The development of leaves on the sprouted scion shoot will always be directly proportionate to the length of scion shoot and studied by Yashwanti (2008) i.e. maximum scion shoot length was recorded with BA treatment with maximum number

of leaves. The maximum number of leaves in sprouted shoot was also observed by Rai *et al.* (1999) in his study on the effect of genotype, method and time of budding in bael and variable response of number of leaves on the sprouted scion was noticed in different genotypes. This variable response may probably be due to the difference of genotypes in the content of endogenous level of BA or cytokinin .According to Zimmerman (1985) maximum number of leaves were recorded when the fresh scion sticks were used for epicotyl grafting which might be due to more stored carbohydrates and other food substance available in the scion sticks after defoliation leads to more growth in terms of number of leaves.These observations are in close conformity with findings of Mathad*et al*.(1991) in mango.

4. Number of lateral shoots : The data on meanlateralshootunder the influence of plant growth regulators at are presented in Table 3. There is significant difference observed among the treatments with respect to number of lateral shoot.The data onlateralshootwas recorded periodically i.e. 30, 45, 60, 75, 90,105 and 120 days after grafting. The mean maximum lateral shoot (7.89) was recorded at P_3 treatment BA 25 ppm followed by (7.78) was recorded at P_1 treatment NAA 50 ppm .The mean minimum lateral shoot (6.89) was recorded at P_0 treatment (control) after 120 days ofgrafting.The polar movement vascular tissues along the flow of auxin (Thompson and Jacob,1966). Xylem differentiation takes place at higher auxin levels .(Jacob, 1952; klee and Estelle, 1991 and Klee *et al*.,1987).The higher auxin treatment will lead to better xylem differentiation of the grafts.Root apical meristems are major sites of synthesis of the free cytokinin in whole plants (Torrey, 1976). The physiological studied indicated that cytokinins play a role in initiating the growth of lateral buds (Shimizu-Sato and Mori, 2001 and Pilate *et al*., 1989)The higher differentiation of xylem by auxin treated grafts will lead to better flow of cytokinin from the roots, which in turn might lead to lateral bud initiation.

Table 2. Effect of foliar spray of NAA, BA on number of leaves, leaf area and number of lateral shoots.

Treatment	Number of leaves	Leaf area	Number of lateral shoot
Water(control) (P_0)	11.27	12.86	6.89
Spray of NAA 50ppm on rootstock (P_1)	19.86	17.66	7.78
Spray of NAA 50ppm on scion(P_2)	18.41	19.91	7.44
Spray of BA25ppm on rootstock (P_3)	21.67	21.95	7.89
Spray of BA 25ppm on scion(P_4)	20.83	24.76	7.44

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