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Effect of pre sowing seed treatments on growth pattern of guava variety l-49

Kalyani Manthri and SG Bharad

Abstract
A study was conducted to find out the effect of pre- sowing seed treatments like water soaking, gibberellic acid, thoiurea, hot water and acid treatments on seedling growth of guava cv. Sardar at Commercial Fruit Nursery Unit, College of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.) during 2012 to 2013. Plant height, number of leaves, leaf chlorophyll index, leaf area, stem diameter of guava seedling were found maximum with 1000 ppm GA_3.

Keywords: guava, pre- treatments, sardar, seedling growth

Introduction
Guava (*Psidium guajava* L.) is one of the important fruit crop of tropical and subtropical regions of India. It is popularly known as "Apple of Tropics" and claims to be the fourth most important fruit in respect of area and production after mango, banana and citrus. It is the member of the family Myrtaceace and it is one of the most exquisite and valuable fruits of the tropics. Guava has earned the popularity as poorman's apple available in plenty to every person at very low price during the season. It is no inferior to apple for its nutritive values. it is an excellent source of vitamin 'C' and pectin. The most important guava growing states in India are Maharashtra (36,000 ha), Bihar (29,400 ha), Uttar Pradesh (14,600 ha), Gujarat (10,200 ha), Madhya Pradesh (9,700 ha) and Andhra Pradesh (8,500 ha) (Anon., 2011). In India production of guava is 2462 thousand MT from an area of 205 thousand ha and the productivity is 12.0 MT/ha. In India Maharashtra stands first in area (36.0 thousand ha) and production (311.0 thousand MT) with a productivity of 8.6 MT/ha (Anon., 2011). Maharashtra produces quality guava during rainy season, which no other state does. In Maharashtra state Ahmednagar, Satara, Beed, Pune, Aurangabad Akola, Buldana and Amravati districts are principal guava growing districts. (Singh, 2009). Guava is hardy, prolific bearer and highly remunerative. The fruit is extensively used in the fruit processing industry and many delicious products such as jam, jelly, excellent -for jelly preparation (Adsule and Kadam, 1995). The common sour wild guava makes the best jelly. Guava can also be canned in sugar or made into fruit butter. The leaves of guava has been used for curing diarrhoea, and also for dyeing and tanning.

The area under guava is increasing rapidly owing to great demand in the international market. Even though the area under guava is increasing, the pace of development is not appreciable. The greatest bottleneck in the expansion of area under fruits is the non-availability of genuine and quality planting materials in adequate quantity from reliable nurseries. Healthy and good quality plant material is the foundation of successful fruit industry in the country (Reddy and Shukla, 2007) [16]. In view of growing importance of fruit crops, the demand for quality planting material has increased manifold throughout the country in the recent past. In most of the fruit crops, rootstock influences the vigour, longevity, tree size, yield and quality (Mukherjee and Majumdar, 1963) [9]. The rootstock is a very vital component of a grafted plant and once the trees are grafted on a certain rootstock and planted in the orchard, it is not possible to change it without incurring losses. Therefore, the good rootstock should posses the qualities like high degree of compatibility with the scion variety, adaptable to the agro-climatic conditions of the proposed area, tolerant to salt, resistant to drought, endurant to frost, resistant to diseases and pests prevailing in the proposed area. So raising of good rootstocks is very important for future amble. over the year, productivity of guava continues to be low.

There are various limiting factors related to production and productivity of guava and one of them is low quality planting material. Method of vegetative propagation have been developed at different research stations to multiply true to type plants with short juvenile stage (Deshmukh,1927; Mukherjee and Singh, 1965; Krishnamurthy, 1965) [4, 9]. For sucessful production of guava, there is a need to produce healthy planting material of important commercial varieties from seeds. Asexual methods like inarching, veneer grafting, stooling, patch and shield budding and air layering (Srivastava, 1964) [19] have been advocated for quick propagation. Seed propagation is important specially in hybridization as well as for raising of rootstocks. In recent years attention has been mainly directed to the use of different chemicals and plant growth regulators in seed germination and seedling growth. Different chemicals are very effective in guava for better germination and seedling growth. The germination of guava seeds is uncertain due to hard seed coat (Singh, 1967) [18], which results in poor germination. Therefore, an attempt was made to minimize germination period as well as to improve germination capability of guava seeds and better seedling growth through certain seed treatments, viz., water soaking, hot water soaking, acid treatments, use of GA_3 and thiourea in variety of sardar (L-49) guava under Akola conditions of Maharastra.

Materials and Methods

The experiment was carried out at Commercial Fruit Nursery Unit, College of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.) during the year 2012 to 2013. Healthy and Ripe uniform size of guava cv. L-49 fruits of Ambebahar crop procured from university Department of Horticulture and seeds were extracted. Those were allowed to dry in shade for few hours and seeds were treated with chemicals and growth regulators. Floated seeds were discarded and seeds settled at the bottom of the beaker were considered for the experiment Treatment wise GA_3 and Thiourea solutions were prepared. The required quantities of GA_3 and thiourea were weighed on the weighing balance. The weighed quantity was dissolved in 5 ml of ethyle alcohol (50%) then required quantity of distilled water was added to make the solutions of desired concentrations. Sound and healthy seeds specially selected for experiment were soaked for 24 hours, with respective seed treatments i.e. tap water soaking, hot water soaking, GA_3 500 ppm and 1000 ppm solution soaking, thiourea 2000 ppm, 4000 ppm solution soaking Seeds of guava were soaked in hot water at 60°c for 24 hours. Fresh and clean water was used for treatment seeds soaked in water for 24 hours in a way that each and every seed homogenously sink in water. The acid scarification of seeds were done for 3 and 5 minutes by concentrated H_2SO_4 and HCL (35%) respectively. taking care that they were uniformly treated without injury, then removed and washed with copious amount of running water to avoid residual effect of acid followed by seeds soaked in water for 24 hours. and the seeds were sown in (25x15cm) size polythene bags on 3 rd august, 2012. Which were punctured to improved the drainage and filled with well mixing of two parts of soil, 1 part of fine sand and 1 part of well rotted FYM in the last week of july. The polythene bags are placed in flat beds and proper space. Irrigation was provided to seeds which were sown in polythene bags by using rose cane and maintained the proper moisture level. The bags were watered every day. The experiment was conducted in CRD and replicated thrice using 50 seeds in each treatment of a replication. They were examined daily for germination counts the seeds which showed the emergence of Cotyledonous leaves were considered as germinated. After 30 days, the number of seeds germinated in each replication were added and calculated on percentage basis. During the entire period of study the seedlings were kept moist by timely application of water. The plant height, number of leaves, stem diameter, leaf chlorophyll index, leaf area were recorded from one month after sowing at monthly intervals.

Results and Discussion

The data presented in Fig.1 indicated that, height of the guava seedlings recorded at monthly interval was significantly influenced by the seed treatments

Effect of different seed treatments on height of the seedling

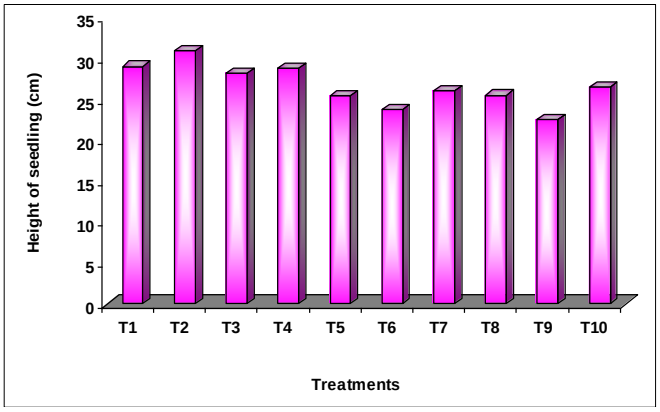

Fig 1: Effect of different seed treatments on helght of the seedling (cm)

The seedling height recorded at 30 days after sowing was found maximum when seeds were treated with $GA_3$1000 ppm (2.51cm) which was found to be at par with T_1 (2.44cm) and T_4 (2.36cm) followed by T_3 (1.97cm), T_{10} (1.90 cm) whereas minimum seedling height (1.25 cm) recorded when seeds were treated with hot water for 24 hrs.Guava seeds pre-treated with GA_3 at 1000 ppm recorded maximum seedling height (4.84 cm), at 60 days after sowing which was statistically at par with T_2 – 500 ppm GA_3 soaking (4.65 cm), T_4 (4.56 cm) and T_3 (4.56 cm) whereas, the seeds pre-treated with hot water recorded significantly minimum seedling height (3.39 cm) over other treatments studied. Seedling height recorded at 90 days after sowing, the maximum height of seedling (8.93 cm) was recorded in T_2 (GA_3 1000 ppm) which was found to be at par with T_1 (8.39 cm) and T_4 (8.18 cm) followed by T_3 (7.59 cm) while minimum seedling height was recorded with hot water treatment (6.57cm) over other treatments studied. Pre-sowing treatment of guava seeds with GA_3 at 1000 ppm recorded maximum seedling height (11.89 cm) at 120 days after sowing which was at par with GA_3 at 500 ppm (11.42 cm) and T_4 (11.33 cm) followed by T_3 (11.16 cm) whereas minimum seedling height was recorded with Hot water (9.41 cm) over other treatments studied. At 150 days after sowing, the maximum height of seedling (14.80 cm) was recorded in T_2 (GA_3 1000 ppm) which was found to be at par with T_1 (14.30 cm), T_4 (13.37cm), and T_3 (12.92 cm) where as minimum height of seedling was recorded in Hot water (10.63 cm).Seedling height recorded at 180 days after sowing, the maximum height of seedling (17.61cm) was recorded in T_2 (GA_3 1000 ppm) which was found to be at par with T_1 (17.37cm) T_4 (15.78 cm) followed by T_4 (15.78 cm) and T_3

(14.47cm) while minimum seedling height was recorded in Hot water treatment (12.19 cm) over other treatments studied. Pre-sowing treatment of guava seeds with GA_3 at 1000 ppm recorded maximum seedling height (22.75 cm) at 210 days after sowing which was found to be at par with T_1 (22.69 cm) and T_4 (22.31cm) followed by T_3 (20.39 cm) whereas minimum seedling height was recorded in Hot water(13.49 cm) over other treatments studied.

Guava seeds pre-treated with GA_3 at 1000 ppm recorded maximum seedling height (30.98 cm), at 240 days after sowing which was statistically at par with T_2 – 500 ppm GA_3 soaking (29.09 cm) and T_4 (28.8 cm) followed by T_3 (28.27 cm) whereas, the seeds pre-treated with Hot water recorded minimum seedling height (22.54) over other treatments studied. The tallest guava seedlings associated when the seeds were treated with GA_3 prior to sowing this might be due to fact that the effect of gibberellic acid in increasing the osmotic uptake of nutrients and thereby causing cell multiplication and cell elongation reflects in greater internodal length, ultimately resulting in increase in plant height. (Dohono and Walker, 1957).These result are conformity with Chandra and Govind (1990) [3] Ganapathy *et al.* (1991) [5], Kumar *et al.* (1991) [21] in Guava, Patil *et al.* (1996), Mankar *et al.* (1997) in Ber, Pawshe *et al.* (1997[a]) [12] in Aonla, Pawshe *et al.* (1997[b]) [12] in Custard apple, Padma and Reddy (1998) [17] in Mango, Wagh *et al.* (1998) in Aonla, Begum *et al.* (1987), Palanisamy and Ramamoorthy (1987), Barche *et al.*,(2010) [2], Dhinesh babu *et al.* (2010) in papaya

Effect of different seed treatments on stem diameter of seedling (cm)

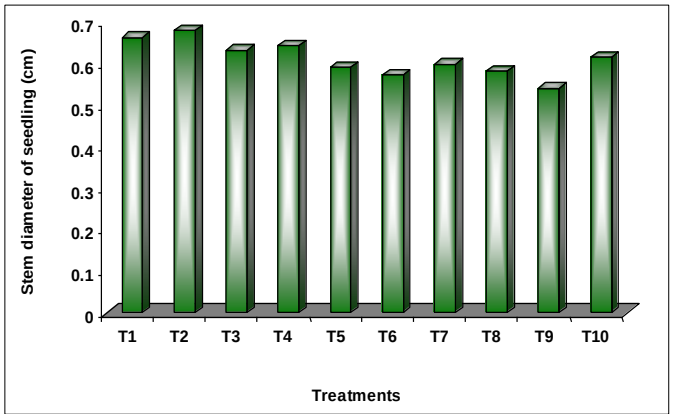

Fig 2: Effect of different seed treatments on stem diameter of seedling (cm)

The stem diameter recorded at 30 days after sowing was maximum (0.133 cm) when seeds were treated with $GA_3$1000 ppm which was at par with GA_3 500 ppm (0.122 cm) and seeds soaked in Thiourea 4000 ppm (0.114 cm) while minimum stem diameter (0.083 cm) recorded when seeds soaked in hot water for 24 hours. At 60 days after sowing of seeds, the stem diameter was observed significantly maximum (0.211cm) when seeds treated with GA_3 1000 ppm followed by (0.195 cm) raised through the seeds were soaked in GA_3 500 ppm and Thiourea @ 4000 ppm (0.182 cm) prior to sowing whereas, minimum stem diameter (0.114 cm) was recorded when the seeds were treated with hot water for 24 hours. Guava seedling gave significantly maximum stem diameter (0.279 cm) at 90 DAS when seeds were soaked in GA_3 1000 ppm prior to sowing followed by (0.260cm) when seeds were treated with GA_3 500 ppm which was found at par with the seeds sown in Thiourea 4000 ppm (0.252cm) and T3 (0.243). Whereas minimum stem diameter (0.184 cm) was observed when seeds treated with hot water for 24 hours.

The stem diameter recorded at 120 days after sowing was maximum (0.36 cm) when seeds treated with $GA_3$1000 ppm which was found to be at par with GA_3 500 ppm (0.35 cm) followed by seeds soaked in Thiourea 4000 ppm (0.33 cm) while minimum stem diameter (0.23 cm) recorded when seeds soaked in hot water for 24 hours.At 150 days after sowing of seeds the stem diameter was observed significantly maximum (0.453 cm) when seeds treated with GA_3 1000 ppm followed by (0.433 cm) raised through the seeds were soaked in GA_3 500 ppm and Thiourea @ 4000 ppm (0.418 cm) prior to sowing whereas, minimum stem diameter (0.305 cm) was recorded when the seeds were treated with hot water for 24 hours. Guava seedling gave significantly maximum stem diameter (0.526) at 180 DAS when seeds were soaked in GA_3 1000 ppm prior to sowing followed by (0.503 cm) when seeds were treated with GA_3 500 ppm whereas minimum stem diameter (0.403 cm) was observed when seeds treated with hot water for 24 hours. The stem diameter recorded at 210 days after sowing was significantly maximum (0.604 cm) when seeds treated with $GA_3$1000 ppm followed by GA_3 500 ppm (0.576 cm), Thiourea 4000 ppm (0.453 cm) while minimum stem diameter (0.43 cm) recorded when seeds soaked in hot water for 24 hours.

Guava seedling gave significantly maximum stem diameter (0.681 cm) at 240 DAS when seeds were soaked in GA_3 1000 ppm prior to sowing followed by (0.665 cm) when seeds were treated with GA_3 500 ppm where as minimum stem diameter (0.542 cm) was observed when seeds treated with hot water for 24 hours. Data presented in figure 2 indicated that, maximum stem diameter were associated when seeds were soaked in $GA_3$1000 ppm prior to sowing which might be due to fact that indogenious level of Gibberellic acid was higher which results in increased cell division, cell elongation and cell multiplication in the cambium tissue that reflects in increase in stem diameter. The above results are conformity with Pawshe *et al.* (1997[a]) [12] and Ratan and Reddy (2004[c]) [14] in custard apple, Pawshe *et al.* (1997[b]) [12] in aonla, Stenzel *et al*. (2003[a]) in atemoya and sugar apple.

Effect of different seed treatments on number of leaves per seedling

The observations at every interval revealed that the differences in the number of leaves per seedling were significantly influenced by different pre sowing treatments during the period of investigation The number of leaves per seedling at 30 days after sowing were ranging from 2.12 to 3.77. The significantly maximum number of leaves per seedling (3.77) was recorded in T_2 treatment *i.e.* GA_3 @ 1000 ppm (24 hours), followed by T_1 treatment (3.27) *i.e.* GA_3 @ 500 ppm (24 hrs), T_4 treatment (2.97) *i.e.* Thiourea @ 4000 ppm (24 hours) and T_3 treatment (2.93) *i.e* Thiourea @2000 ppm (24 hours) while minimum number of leaves per seedling (2.12) was recorded under Hot water treatment. The number of leaves per seedling at 60 days after sowing were ranging from 5.67 to 8.73. The maximum number of leaves per seedling (8.73) was recorded in T_2 treatment *i.e.* GA_3 @ 1000 ppm (24 hours), it was statistically at par with T_1 treatment (8.40) *i.e.* GA_3 @ 500 ppm (24 hrs), T_4 treatment (8.27) *i.e.* Thiourea @ 4000 ppm (24 hours) and T_3 treatment (8.00) *i.e* Thiourea @2000 ppm (24 hours), whereas minimum number of leaves per seedling (5.67) was recorded under Hot water treatment. The number of leaves per seedling at 90 days

after sowing were ranging from 9.23 to 12.87. the maximum number of leaves per seedling (12.87) were recorded in T_2 treatment *i.e.* GA_3 @ 1000 ppm (24 hours), it was statistically at par with T_1 treatment (12.67) *i.e.* GA_3 @ 500 ppm (24 hrs), T_3 treatment (11.67) *i.e.* Thiourea @ 2000 ppm (24 hours) and T_4 treatment (12.00) *i.e* Thiourea @4000 ppm (24 hours), where minimum number of leaves per seedling (9.23) was recorded under hot water treatment Maximum number of leaves (18.03) were recorded in 120 days old seedlings of guava when seeds treated with GA_3 1000 ppm which was at par with T_1 (16.23) when seeds treated with GA_3 500 ppm whereas minimum number of leaves per seedling (12.40) was recorded under hot water treatment. At 150 days after sowing the leaves per seedling were maximum when the seeds were treated with GA_3 1000 ppm (22.10) which was at par with followed by seeds treated with GA_3 500 ppm (18.73) whereas minimum numbers of leaves per seedling (13.93) were recorded under hot water treatment. Maximum number of leaves (26.53) were recorded in 180 days old seedlings of guava when seeds were treated with $GA_3$1000 ppm followed by (23.73) when seeds treated with GA_3 500 ppm. Whereas minimum number of leaves per seedling (14.90) were recorded under hot water treatment. Maximum number of leaves (30.53) were recorded at 210 days after germination when seeds were treated with GA_3 1000 ppm which was at par with seeds soaked in GA_3 500 ppm solution (27.77). Whereas minimum number of leaves per seedling (16.40) was recorded under hot water treatment. Significantly maximum number of leaves (34.20) were recorded at 240 days after germination when seeds were treated with GA_3 1000 ppm followed by (31.74) in seeds soaked in GA_3 500 ppm solution whereas minimum number of leaves per seedling (18.53) were recorded under hot water treatment.

This might be due to fact that, gibberellic acid increasing the osmotic uptake of nutrients and their by causing cell elongation and greater internodal length and ultimately resulting in increase in plant height and this increase in plant height might be responsible for increase in number of leaves per seedling. The above results are conformity with Singh (1979) in citrus, Pandit *et al.* (2001) and Barche *et al.* (2010) [2] in papaya, Pawshe *et al.* (1997[a]) [12] in custard apple.

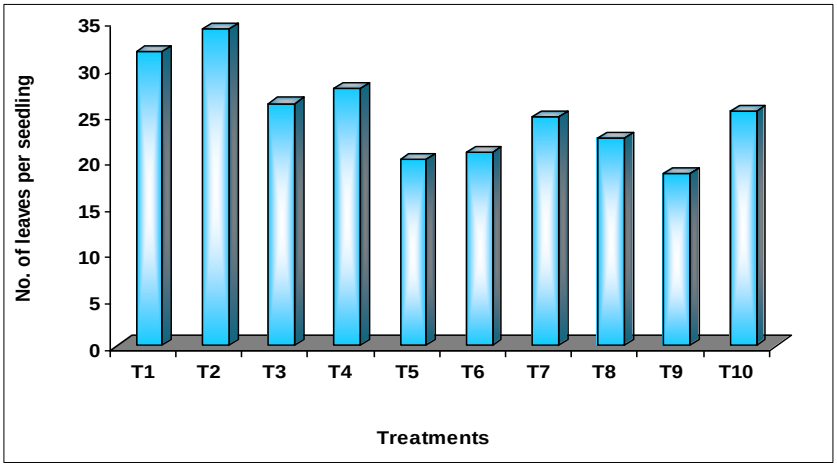

Fig 3: Effect of different seed treatments on number of leaves per seedling

Effect of different seed treatments on leaf area of seedling (cm2)

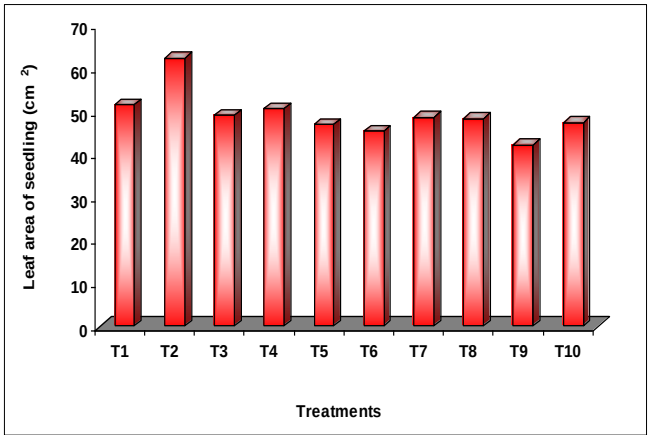

Fig 4: Effect of different seed treatments on leaf area of seedling (cm^2)

Significantly maximum leaf area (3.13 cm^2) was recorded at 60days after sowing when seeds were treated with GA_3 1000 ppm followed by seed treated with GA_3 500 ppm (2.62 cm^2) whereas minimum leaf area (1.48 cm^2) with Hot water treatments. The leaf area recorded at 90 days after sowing was found significantly maximum when seeds were treated with GA_3 1000 ppm (10.28 cm^2) followed by GA_3 500 ppm (7.52 cm^2) while, minimum leaf area (5.37 cm^2) recorded in hot water soaking for 24 hours. Significantly maximum leaf area (23.23 cm^2) was recorded at 120 days after sowing when seeds were treated with GA_3 1000 ppm followed by seeds treated with GA_3 500 ppm (15.08 cm^2) whereas minimum leaf area (8.44 cm^2) with hot water treatment. The leaf area recorded at 150 days after sowing was found maximum when seeds were treated with $GA_3$1000 ppm (30.20 cm^2) which was at par with GA_3 500 ppm (27.01 cm^2) while, minimum leaf area (18.74 cm^2) recorded in hot water soaking for 24 hours. Significantly maximum leaf area (40.28 cm^2) was recorded at 180days after sowing when seeds were treated with GA_3 1000 ppm followed by seed treated with GA_3 500 ppm (35.79 cm^2) whereas minimum leaf area (25.52 cm^2) with hot water treatment. The leaf area recorded at 210 days after sowing was found significantly maximum when seeds were treated with GA_3 1000 ppm (51.66 cm^2) followed by GA_3 500 ppm (43.92 cm^2) while, minimum leaf area (35.74 cm^2) recorded in hot water soaking for 24 hours. Significantly maximum leaf area (62.45 cm^2) was recorded at 240 days after sowing when seeds were treated with GA_3 1000 ppm followed by seed treated with GA_3 500 ppm (51.67 cm^2) whereas minimum leaf area (42.17 cm^2) with hot water treatment. The presented data in figure 4 revealed that, maximum leaf area associated when

the seeds were soaked in GA_3 prior to sowing. This might be due to fact that, gibberellic acid seed treatment can be attributed to increase cell division, cell elongation and cell multiplication which reflect in maximum leaf area. The results are conformity with the Pawshe *et al.* (1997) [12] in custard apple, and Pandit *et al.* (2001) and Barche *et al.* (2010) [2] in papaya.

Effect of different seed treatments on leaf chlorophyll index

At 60 days after sowing of seeds it was observed that, maximum leaf chlorophyll index was recorded in treatment T_2 - GA_3 1000 ppm (35.89) which was at par with T_1 - GA_3 500 ppm (34.18), T_4 -Thiourea 4000 ppm (31.49), T_3 -Thiourea 2000 ppm (31.41), T_{10} – water soaking (30.55), whereas, minimum chlorophyll index was noticed under T_9 Hot water soaking(23.45). Guava seedling gave significantly maximum leaf chlorophyll index (40.91) at 90 DAS when seeds were soaked in GA_3 1000 ppm prior to sowing which was at par with (39.79) when seeds were treated with GA_3 500 ppm, Thiourea 4000 ppm (39.49) whereas minimum leaf chlorophyll index (36.20) was observed when seeds treated with Hot water for 24 hours. The leaf chlorophyll index recorded at 120 days after sowing was maximum (43.28) when seeds treated with $GA_3$1000 ppm which was at par with GA_3 500 ppm (41.21) and Thiourea 4000 ppm (40.73) and Thiourea 2000ppm (40.66) followed by Tap water soaking (39.97). while minimum leaf chlorophyll index (36.93) recorded when seeds soaked in Hot water for 24 hours. At 150 days after sowing of seeds the leaf chlorophyll index was observed maximum (50.33) when seeds treated with GA_3 1000 ppm which was found at par with the leaf chlorophyll index of seedling (47.63) raised through the seeds were soaked in GA_3 500 ppm and Thiourea 4000 ppm (47.53) prior to sowing whereas, minimum leaf chlorophyll index (42.02) was recorded when the seeds were treated with Hot water for 24 hours. At 180 days after sowing of seeds the leaf chlorophyll index was observed significantly maximum (55.67) when seeds treated with GA_3 1000 ppm followed by (52.76) seedlings raised through the seeds were soaked in GA_3 500 ppm prior to sowing whereas, minimum leaf chlorophyll index (43.99) was recorded when the seeds were treated with Hot water for 24 hours. Guava seedling gave significantly maximum leaf chlorophyll index (60.66) at 210 DAS when seeds were soaked in GA_3 1000 ppm prior to sowing followed by (56.66) when seeds were treated with GA_3 500 ppm whereas, minimum leaf chlorophyll index (45.14) was observed when seeds treated with Hot water for 24 hours. Guava seedling gave significantly maximum leaf chlorophyll index (65.70) at 240 DAS when seeds were soaked in GA_3 1000 ppm prior to sowing followed by (60.89) when seeds were treated with GA_3 500 ppm where as, minimum leaf chlorophyll index (48.10) was observed when seeds treated with Hot water for 24 hours. The data presented in figure 5 indicated that, chlorophyll index recorded at 30 days interval from 60 to 240 days after sowing was associated with treatment T_2 GA_3 1000 ppm seed treatment. This might be due to synthesis of protein in plants get accelerated, which is indirectly exhibited by increase in leaf chlorophyll content. These results are in conformity with Shikhamany and Reddy (1986) [16] in Thompson seedless grape, Aariff Khan and Hameedunnisa Begum (2007) [1] In Acid lime

Increasing concentrations of GA_3 and thiourea also increased these parameters owing to invigoration of physiological process of plants and stimulatory effect of chemicals to form new leaves at faster rates. It has also been reported that an increased rate of photosynthetic activity by the application of chemicals like GA_3 at particular concentration accelerated transport and efficiency of utilizing photosynthetic products resulting in the cell elongation and rapid cell division in the growing portion.(Phinney *et al*., 1957; Sargant, 1965) [13, 15].

Effect of different seed treatments on leaf chlorophyll index

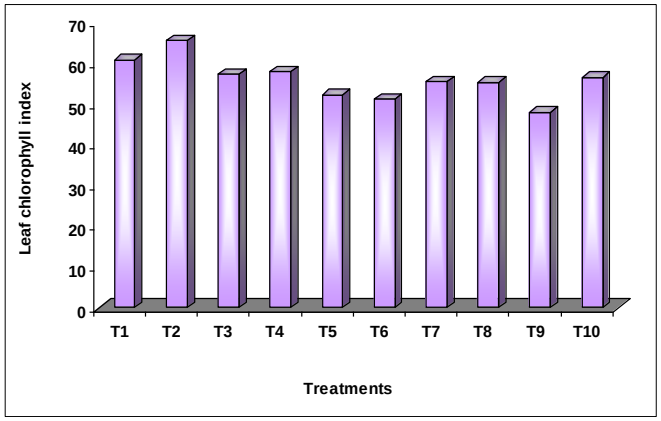

Fig 5: Effect of different seed treatments on leaf chlorophyll index

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