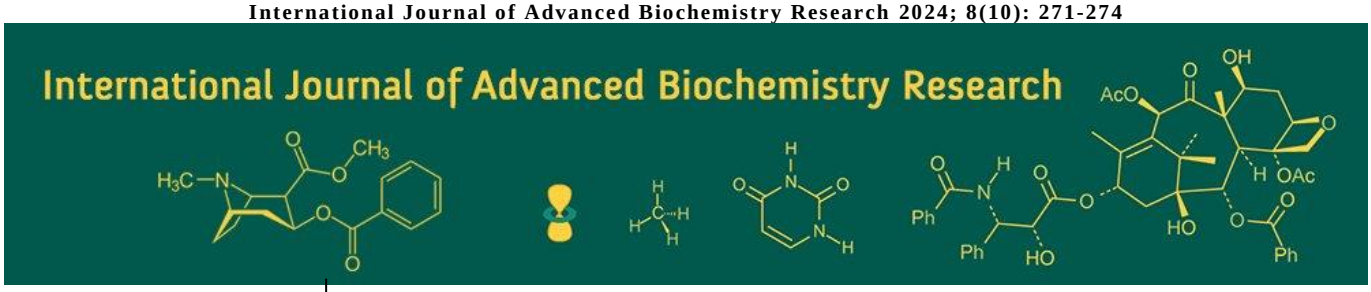

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DJ Sreekar
PG Scholar, Department of Fruit Science, Dr. YSRHU, College of Horticulture, Venkataramannagudem, Andhra Pradesh, India

R Rajya Lakshmi
Associate Dean, Dr. YSRHU, College of Horticulture, Parvathipuram, Andhra Pradesh, India

A Himabindu
Assistant Professor, Department of Fruit Science, Dr. YSRHU, College of Horticulture, Parvathipuram-Andhra Pradesh, India

P Subbaramamma
Associate Professor, Department of Plant Physiology, Dr. YSRHU, College of Horticulture, Venkataramannagudem, Andhra Pradesh, India

V Sivakumar
Scientist (Horticulture) & Horticulture Research Station, Dr. YSRHU, Andhra Pradesh, India

V Sekhar
Assistant Professor, Department of Statistics, Dr. YSRHU, College of Horticulture, Venkataramannagudem, Andhra Pradesh, India

Corresponding Author:
DJ Sreekar
PG Scholar, Department of Fruit Science, Dr. YSRHU, College of Horticulture, Venkataramannagudem, Andhra Pradesh, India

Studies on effect of wedge grafting in different varieties of avocado under North coastal region of Andhra Pradesh

DJ Sreekar, R Rajya Lakshmi, A Himabindu, P Subbaramamma, V Sivakumar and V Sekhar

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Abstract
The present study was conducted in the shade net condition of farmer's fields in the Salur village of Parvathipuram Manyam District of Andhra Pradesh in the years 2023–2024. The Complete Randomised Design was used to lay out the experiment with 3 treatments were T_1- Reed, T_2- TKD-1 and T_3-Fuerte. The maximum leaf length (13.30 cm), leaf width (5.51 cm), leaf fresh weight (1.42 g), leaf dry weight (0.43 g), graft diameter (1.22 cm), graft height (57.05 cm), sprout diameter (0.55 cm) and sprout length (23.45 cm) were recorded in T_1- Reed and number of leaves per graft (37.66) and highest success percentage (68.10%) was recorded in T_3- Fuerte. Among the different varieties of Avocado best result shown in Reed hence it is suggested to be suitable for growing under North Coastal region of Andhra Pradesh.

Keywords: Reed, TKD-1, Fuerte, wedge grafting, avocado

Introduction
Avocado (*Persea americana* Mill.) also called as alligator pear or butter fruit and it is a sub-tropical evergreen tree belongs to the family Lauraceae. Avocado is a native of Central America with chromosome number of 2n = 24. It was introduced from Sri Lanka about 75 to 100 years ago in South and West Coast of India at Ganeshkhind fruit research station, Pune, Maharashtra. Avocados have the high energy value, providing 245 calories per 100 grams of fruit pulp. The pulp of the avocado is rich in proteins and fat but low in carbohydrates. It has little sugar so the fruit is found to be good for diabetics. Several studies have shown that the avocado gives protection against oxidative stress-related diseases and age-related degeneration, including coronary heart disease, cataracts and several forms of cancer (Ramos *et al*., 2019) [9]. The annual production of avocado in the world is 45 lakh metric tonnes growing on 6 lakh hectares area. Mexico is the leading country contributing 28% production of the world. The annual production of avocados ranges from 500 to 1,000 metric tonnes in India (Bal, J.S., 2014) [2]. The demand for avocado fruit in India is increasing day by day, but production remains limited due to the lack of commercial orchards. This is primarily because of the non-availability of quality planting material. Due to its high demand, the production of quality planting material with a good success rate is essential to acclimatize and domesticate the crop in the tropical conditions of Andhra Pradesh. Avocado is propagated through sexual seed propagation but sexual propagation leads to heterozygosity, long pre-bearing phase, time consuming process, pollination dependence, not true to type, disease and pest susceptibility. Thus, in order to get true to type uniform quality planting material, vegetative propagation is needed. One of the methods followed in vegetative propagation is grafting.

Materials and Methods
The present experiment was carried out in the shade net condition of farmers field at Salur, village of Parvathipuram Manyam District located at Geographical location of 18.53° N latitude and 83.21° E longitude with an average elevation of 118 m (387 feet) MSL. It receives an average annual rainfall of 1074mm and temperature ranges between 17-40 °C during the period under the report.

The Complete Randomised Design was followed and it contains 3 treatments and 5 replications. The treatments were used three varieties: T_1- Reed, T_2- TKD-1 and T_3- Fuerte. The grafting method followed is wedge grafting. The collected and cured scion varieties are sliced in V- shape at bottom and the same time take one year old vigorous rootstock grown in 10" x 10" size polybag cut the top portion with sharp grafting knife and split same as scion that fit into the rootstock and tied with a polythene tape. The observations recorded for grafting were leaf length (cm), leaf width (cm), leaf fresh weight (g), leaf dry weight (g), graft diameter (cm), graft height (cm), sprout diameter (cm), sprout length (cm) and success percentage (%) were observed at 300 days after grafting.

1. Leaf length (cm)
The leaf length of five middle leaves of the emerged shoots from the grafts were measured from base to the tip using a 30 cm measuring scale. The values were reported in centimetre.

2. Leaf width (cm)
The leaf width of five middle leaves of the emerged shoots from the grafts were measured widest point perpendicular to the longitudinal axis using a 30 cm measuring scale. The values were reported in centimetre.

3. Leaf fresh weight (g)
The five fresh leaves at the middle portion of the emerged shoots were collected from the grafted plants and weighed with the help of electronic balance (CAS company model- CBL) and values were expressed in grams.

4. Leaf dry weight (g)
The fresh leaves were placed in a hot air oven (RIA Instruments company) at 55 °C for 24 hours, after that the weight of the leaves were measured with electronic balance (CAS company model- CBL).

5. Number of leaves per graft
The number of leaves were measured by counting total number leaves in a graft.

6. Graft diameter (cm)
The graft diameter was measured by digital vernier calliper (Mitutoyo company) at middle of the graft joint.

7. Graft height (cm)
The graft height is taken as measurement from graft joint to the shoot tip and it was measured by using 30 cm measuring scale.

8. Sprout diameter (cm)
Sprout diameter was measured by using digital vernier calliper (Mitutoyo company) at middle of the emerging sprouts.

9. Sprout length (cm)
Sprout length of the grafts was measured by using 30 cm measuring scale of the emerging sprouts.

10. Success percentage (%)
Success percentage was measured by ratio between success grafts after 300 days to the total number of grafts and the value was multiplied by 100.

$$\text{Success percentage of grafts (\%)} = \frac{\text{Number of success grafts after 300 days}}{\text{Total number of cuttings}} \text{X } 100$$

Results and Discussion
The table 1 and figure 1 shows the results of leaf length, leaf width, leaf fresh weight, leaf dry weight and number of leaves per graft of the grafts of various avocado varieties at 300 days after grafting. Among the different varieties of avocado grafts, the highest leaf length (13.30 cm) was recorded in T_1- Reed and the lowest leaf length (11.44 cm) was observed in T_2- TKD-1. This variation results from the scion developing more slowly on some rootstocks while growing more quickly on others and the vigour of succeeding scion cultivars is influenced by the grafting success, similar finding was observed by Minja *et al*. (2017) [7] in mango. The highest leaf width (5.51 cm) was recorded in T_1- Reed while the lowest leaf width (5.09 cm) was observed in T_2- TKD-1 This difference could be caused by the scion and rootstock growing rapidly because of early protein and carbohydrate synthesis and the quick completion of physiological development, the result of present investigation is supported by Archana (2022) [1] in sapota. The highest leaf fresh weight (1.42 g) was recorded in T_1- Reed and the lowest leaf fresh weight (1.10 g) was observed in T_2- TKD-1. The genetic makeup of the scions, which influences the graft's histology and metabolic functions, may be connected to these variations. It might be the outcome of gaining weight as a result of producing more energy, which are necessary for the plant's vegetative growth, similar result was observed by Pawar *et al*. (2018) [8] in custard apple. The highest leaf dry weight (0.43 g) was recorded in T_1- Reed whereas the lowest leaf fresh weight (0.38 g) was observed in T_2- TKD-1. Improved vegetative growth may be the cause, as evidenced by the statistics, which demonstrates that higher vegetative growth considerably raises dry weight, comparable outcome was observed by Kaur (2017) in mango [5]. The maximum number of leaves (37.66) were recorded in T_3- Fuerte and minimum number of leaves were observed in T_2- TKD-1. It could be due to the uptake of more water and minerals leads to the increase of photosynthetic rate there by leads to the production of a greater number of leaves. This result was supported by Girase *et al*. (2022) in aonla [4].
The table 2 and figure 2 represents the results of graft diameter, graft height, sprout diameter, sprout length and success percentage at 300 days after grafting. Among the different varieties of avocado grafts, the highest graft diameter (1.22 cm) was recorded in T_1- Reed while the lowest was observed in T_3- Fuerte (1.08 cm). The potential cause of the observed variance in graft diameter could be the compatibility between the scion and stock, facilitating better food material transfer from foliage to different plant components, similar result was observed by Silas *et al*. (2023) [11] in mango. The highest graft height (57.05 cm) was recorded in T_1- Reed while the lowest graft height (27.52 cm) was observed in T_3- Fuerte. Higher graft height is the result of greater primary growth due to photosynthetic food produced in leaves, comparable outcome was recorded by Emire *et al*. (2021) [3] and Kulkarni and Nayaka (2023) [6] in avocado. The highest sprout diameter (0.55 cm) was recorded in T_1- Reed and lowest sprout diameter (0.35 cm) was observed in T_3- Fuerte. The formation of greater shoot diameter is a result of the increased vegetative growth, similarly result was observed by Singh and Singh (2015) [12]

in sapota. The highest sprout length (23.45 cm) was recorded in T₁- Reed while the lowest sprout length (6.96 cm) was observed in T₃- Fuerte This longest sprout length might have been the consequence of early sprouting aided by robust vascular cambium activity, appropriate union healing and improved initial graft union formation, similar result was noticed by Srinivas *et al.* (2022) [13] in mango. The highest success percentage (68.10%) was recorded in T₃- Fuerte whereas the lowest success percentage (61.92%) was observed in T₂- TKD-1. Guatemalan varieties can be grafted on Guatemalan or hybrid rootstocks or in combination with Guatemalan or hybrid intermediate stem pieces appear to be quite successful comparable outcome was observed by Schroeder and Frolich (1955) [10] in avocado.

Table 1: Effect of wedge grafting in different varieties of avocado on leaf length, leaf width, leaf fresh weight, leaf dry weight and number of leaves per graft in North Coastal region of Andhra Pradesh.

Treatments	Leaf length (cm)	Leaf width (cm)	Leaf fresh weight (g)	Leaf dry weight (g)	Number of leaves per graft
T₁- Reed	13.3	5.51	1.42	0.43	31.76
T₂- TKD-1	11.44	5.09	1.10	0.38	24.84
T₃- Fuerte	12.04	5.23	1.18	0.39	37.66
S.Em±	0.39	0.03	0.01	0.006	0.52
CD at 5%	1.23	0.09	0.06	0.018	1.62

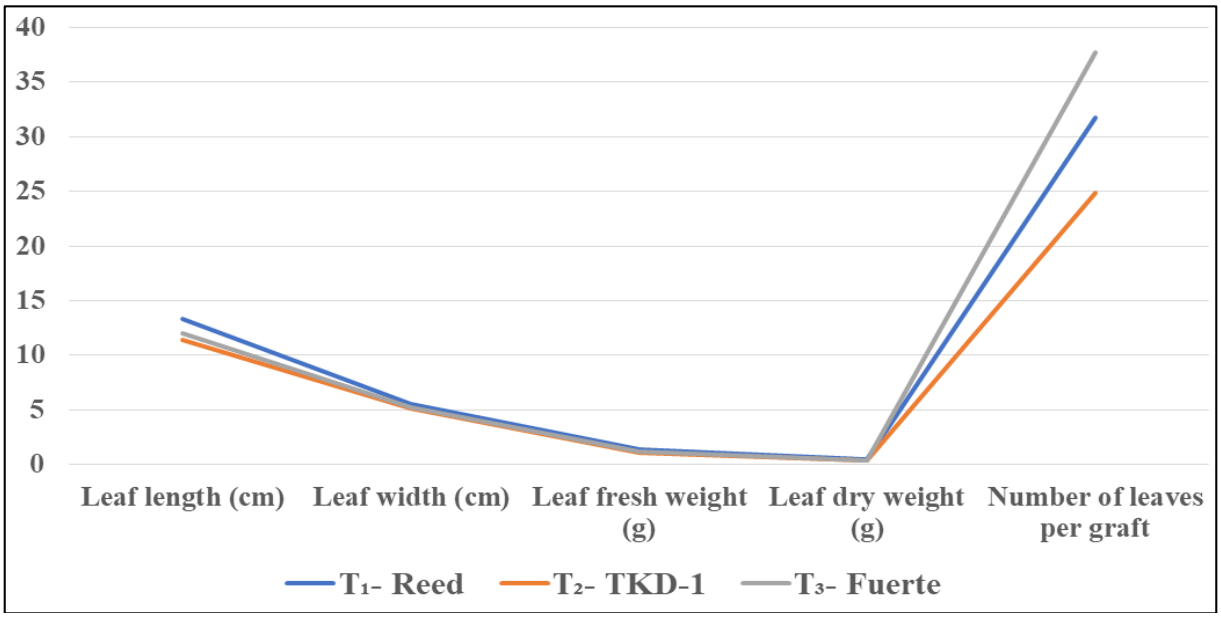

Fig 1: Effect of wedge grafting in different varieties of avocado on leaf length, leaf width, leaf fresh weight and leaf dry weight in North Coastal region of Andhra Pradesh.

Table 2: Effect of wedge grafting in different varieties of avocado on graft diameter, graft height, sprout diameter, sprout length and success percentage in North Coastal region of Andhra Pradesh

Treatments	Graft diameter (cm)	Graft height (cm)	Sprout diameter (cm)	Sprout length (cm)	Success percentage (%)
T₁- Reed	1.22	57.05	0.55	23.45	67.00
T₂- TKD-1	1.20	43.61	0.50	16.60	61.92
T₃- Fuerte	1.08	27.52	0.35	6.96	68.10
S.Em±	0.02	0.93	0.01	0.50	1.20
CD at 5%	0.07	2.92	0.03	1.58	3.75

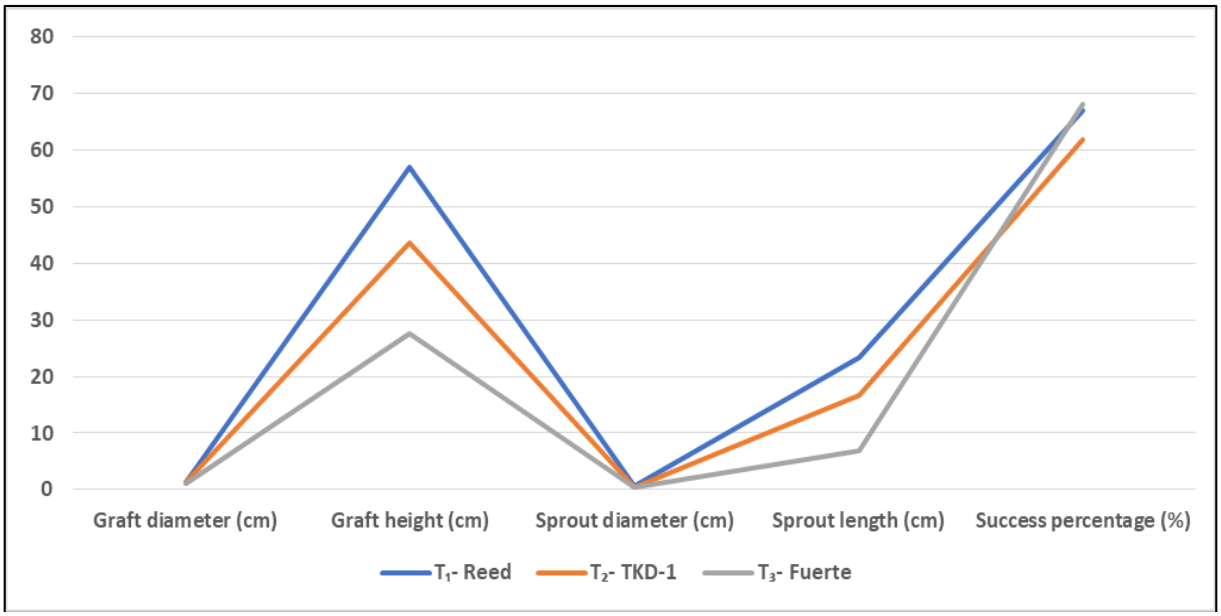

Fig 2: Effect of wedge grafting in different varieties of avocado on graft diameter, graft height, sprout diameter, sprout length and success percentage in North Coastal region of Andhra Pradesh

Conclusion

In the present investigation on wedge grafting of avocado, the best result for different parameters of leaf character i.e. leaf length, leaf width, leaf fresh weight, leaf dry weight and graft parameter i.e. graft diameter, graft height, sprout diameter, sprout length were observed in Reed variety. Hence Reed variety of Avocado is suggested to be suitable for growing in North Coastal region of Andhra Pradesh.

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