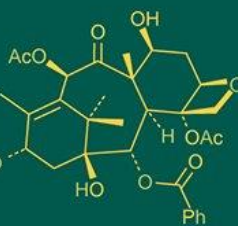
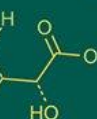
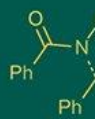
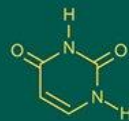
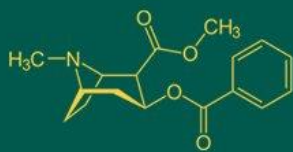


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Effect of different leaf extracts on post harvest quality and vase life of gerbera (*Gerbera jamesonii* Bolus ex. Hook) cut flowers

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Abstract

The experiment was carried out to study the effect of different leaf extracts on extension of post harvest vase life and keeping quality of cut gerbera flowers in completely randomized design with three replications during 2022-23 to 2023-24 at Floricultural Research Station, Agricultural Research Institute, Rajendranagar, Hyderabad. Among different leaf extracts, it was found that at the end of vase life neem leaf extract at 1% recorded the maximum water uptake (17.05 g/f), fresh weight change (84.49%), vase life (12.67 days) and anthocyanin content (7.13 mg/g), Whereas pongamia leaf extract at 1% recorded less scape bending.

Keywords: Gerbera, vase life, leaf extracts, neem, postharvest quality, water uptake

Introduction

Gerbera (*Gerbera jamesonii* Bolus ex. Hook) also known as Transvaal daisy, Barbeton daisy or African daisy belonging to family Asteraceae and originated from South Africa and Asia. It occupies a significant position in international market, ranking among the top 10 cut flowers and is a popular cut flower in Holland Germany and USA (Darras, 2021) [4]. It is popular because of its attractive colour, big size flower, and suitability for distant transport. The daisy like dazzling and magnificent flower is used for vase decoration, flower arrangement, exhibitions and bouquet preparation. Vase-life is frequently employed as a measure of cut flower lifespan after harvest. Cut flowers have a shorter vase life because they are susceptible to substantial postharvest losses. As a result, there arises the need of appropriate postharvest handling technologies (Nowak and Rudnicki, 1990) [12]. Maintaining water relations and delaying senescence are critical for extending the vase life of gerbera. Leaf extracts from various plant species have emerged as natural, eco-friendly alternatives to synthetic preservatives for maintaining postharvest quality in cut flowers. These extracts are rich in bioactive compounds such as phenolics, flavonoids, and antioxidants, which can inhibit microbial growth, reduce oxidative stress, and delay senescence (Singh *et al.*, 2017 and Kaur *et al.*, 2020) [16, 7]. Application of leaf extracts in vase solutions has been reported to significantly extend the postharvest vase life of gerbera by improving relative water content, reducing microbial proliferation in stem xylem, and enhancing antioxidant enzyme activity (Doğan Meral *et al.*, 2024 and Seyed Hajizadeh *et al.*, 2024) [5, 15]. The use of such natural extracts is gaining attention as an eco-friendly and cost-effective strategy for maintaining flower quality while reducing reliance on chemical preservatives. The present study was undertaken to evaluate the effect of different leaf extracts on the postharvest vase life, water relations, and overall quality of gerbera cut flowers.

Materials and Methods

The present experiment was conducted at Floriculture Research Station, (Agricultural Research Institute) Rajendranagar, Sri Konda Laxman Telangana Horticulture University, Hyderabad during 2022-23 to 2023-24 in completely randomized design with thirteen treatments and three replications. Treatment details are T₁-Neem leaf extract @ 1%, T₂-Neem leaf extract @ 3%, T₃-Neem leaf extract @ 5%, T₄-Seethaphal leaf extract @ 1%, T₅-

Seethaphal leaf extract @ 3%, T₆-Seethaphal leaf extract @ 5%, T₇-Pongamia leaf extract @ 1%, T₈-Pongamia leaf extract @ 3%, T₉-Pongamia leaf extract @ 5%, T₁₀-Guava leaf extract @ 1%, T₁₁-Guava leaf extract @ 3%, T₁₂-Guava leaf extract @ 5%, T₁₃-Control (Distilled water). Leaf Extracts of guava, neem, pongamia, and seethaphal were extracted according to the methods of Rahman *et al.*, (2012) [14] with some modifications.

Flower stems were trimmed under water to 40 cm. The stems were recut at the base before placing them in the solutions Lemper (1981) [8]. In each glass bottle five flowers were placed and were considered as one replication. After recording fresh weight, the individual flower stems were placed randomly in the 500 ml glass bottles containing 250 ml of different leaf extract solutions. The weight of each container and the solution with and without flower stems were recorded once in two days. water uptake, fresh weight change, scape bending curvature, vase life and anthocyanin content in gerbera cut flowers were recorded. The collected data were subjected to statistical analysis following the method outline by Panse and Sukhatme (1978) [13].

Results and Discussion

Water uptake (g/f)

The data recorded on water uptake (g/f) during vase life period of cut gerbera held in different preservative solutions of herbal leaf extracts are presented in the Table 1. Maximum water uptake was recorded in T₁-Neem leaf extract at 1% (18.56, 19.29, 19.09, 17.67, 17.05 g/f) followed by T₇-Pongamia leaf extract at 1% (17.02, 18.26, 17.75, 17.19, 16.73 g/f) and minimum was recorded in T₆-Seethaphal leaf extract at 5% (16.16, 17.88, 17.04, 13.67, 7.02 g/f) from day 2 to 10 and all other remaining treatments recorded the intermediate values. Better water relations in treatment neem extract at 1% might be due to its antimicrobial property, which has prevented growth of microbes which in turn inhibited the plugging of water conducting tissues. This is in conformity with the research findings of Murthy (2015) [9] in gerbera, Vinithbabu *et al.*, (2024) [18] in roses and Nirmala *et al.*, (2019) [11] in chrysanthemum.

Fresh weight change (%)

Data pertaining to the Fresh Weight Change (FWC) during vase life period of cut gerbera held in different herbal extract solutions is presented in the Table 2 Maximum values of FWC was recorded in the flowers treated with the treatment T₁-Neem leaf extract at 1% (108.36, 101.99, 102.57, 91.72, 84.49 %) followed by T₇-Pongamia leaf extract at 1% (110.42, 112.21, 99.7, 91.6, 83.42%) and the lowest value for fresh weight change was recorded in treatment T₆-Seethaphal leaf extract at 5% (92.65, 89.20, 86.7, 75.86, 68.62 %). The enhancement in fresh weight observed in neem-treated flowers can be attributed primarily to the antimicrobial properties of the bioactive compounds present in neem leaves, such as azadirachtin, nimbin, and salannin. This result aligns with the findings of Sunanda (2007) [17] in cut caration cv. Domingo, Bhanumurthy (2013) [1] in cut gerbera cv. Savannah who demonstrated that neem-based formulations reduced bacterial growth and maintained stem xylem conductivity in cut flowers.

Scape bending curvature (Score)

The data recorded in Table 3 for Scape bending due to various treatments differed significantly. Among all the treatments there was less scape bending observed in the flowers treated with Pongamia leaf extract at 1% (T₇) followed by neem leaf extract at 1% (T₁) upto 8 days where as more scape bending was recorded in the flowers treated with Seethaphal leaf extract at 5% (T₆) i.e. (3.13) at day 8. Neem and pongamia leaf extracts demonstrated the most notable effects in maintaining stem straightness. Neem is well known for its antimicrobial and antifungal properties due to compounds like azadirachtin and nimbin, which may help prevent xylem blockage. Pongamia extract with flavonoids and bioactive compounds that potentially act against microbial contaminants.

Vase life (days)

Data pertaining to the vase life of cut gerbera held in different leaf extracts solutions is presented in the Table 4. The highest vase life (12.67 days) was recorded for treatment T₁-Neem leaf extract at 1% which was at par with T₇-Pongamia leaf extract at 1% (11.83 days), Whereas the lowest vaseslife of (8.00 days) was observed in T₆-Seethaphal leaf extract at 5% which was at par with all higher concentrations and T₁₃-Control (Distilled water) which recorded (8.97 days) of vaseslife. Among the treatments, neem leaf extract showed a significant positive effect on extending vase life, consistent with the findings of Murthy and Subbaiah (2020) [10], who reported that neem-based preservative solutions enhanced water uptake, reduced microbial growth, and increased anthocyanin content in *Gerbera jamesonii*. The antimicrobial and antioxidant compounds in neem, such as azadirachtin, nimbin, and flavonoids, help prevent vascular blockage and delay senescence. Similarly, pongamia leaf extract, rich in karanjin and pongamol, improved vase life by maintaining xylem conductivity and reducing electrolyte leakage (Nirmala *et al.*, 2019) [11]. These results agree with Kasem *et al.*, (2020) [6] in *Solidago* cut spikes and Chandrasekhar and Gopinath (2004) [2] in cut carnations.

Anthocyanin content (mg/g)

Data regarding anthocyanin content during vase life period of cut gerbera held in different leaf extracts solutions is presented in the Table 4. Initial anthocyanin content in flowers was recorded almost same in all the treatments. Whereas final anthocyanin content at the end of vaseslife the highest anthocyanin content was recorded in the flowers treated with treatment T₁-Neem leaf extract at 1% was (7.13 mg/g) which was followed by T₇-Pongamia leaf extract at 1% (6.72 mg/g). The lowest anthocyanin content (6.09 mg/g) was recorded in the treatment T₆-Seethaphal leaf extract at 5%. Anthocyanins which are responsible for the vibrant coloration of gerbera petals, are highly sensitive to oxidative degradation and microbial activity during postharvest storage. These findings are supported by Murthy and Subbaiah (2020) [10], in cut gerbera cv. Savannah. The improved anthocyanin retention in neem-treated flowers may also result from better membrane integrity and reduced lipid peroxidation, suggesting that neem extract acts not only as a microbial inhibitor but also as a physiological preservative.

Table 1: Effect of leaf extracts on water uptake (g/f) of cut gerbera cv. Ankur

Treatments (T)	Interval of Observations (Days)				
	2 nd Day	4 th Day	6 th Day	8 th Day	10 th Day
T ₁ -Neem leaf extract @ 1%	18.56	19.29	19.09	17.67	17.05
T ₂ -Neem leaf extract @ 3%	18.45	20.13	19.91	17.64	16.09
T ₃ -Neem leaf extract @ 5%	14.96	16.21	15.53	11.86	9.02
T ₄ -Seethaphal leaf extract @ 1%	17.95	18.37	18.81	16.9	10.46
T ₅ -Seethaphal leaf extract @ 3%	16.34	18.63	16.81	15.76	9.32
T ₆ -Seethaphal leaf extract @ 5%	16.16	17.88	17.04	13.67	7.02
T ₇ -Pongamia leaf extract @ 1%	17.02	18.26	17.75	17.19	16.73
T ₈ -Pongamia leaf extract @ 3%	17.45	19.13	17.91	16.32	9.46
T ₉ -Pongamia leaf extract @ 5%	15.44	17.09	13.77	11.48	7.47
T ₁₀ -Guava leaf extract @ 1%	15.34	17.18	15.7	14.3	9.38
T ₁₁ -Guava leaf extract @ 3%	16.19	17.93	17.3	15.91	9.21
T ₁₂ -Guava leaf extract @ 5%	16.97	18.77	14.08	11.68	7.48
T ₁₃ -Control (Distilled water)	13.51	15.52	12.67	10.89	8.32
Mean	16.49	18.03	16.64	14.71	10.54
S.E(m) ±	0.012	0.16	0.11	0.09	0.08
CD at 5%	0.037	0.28	0.35	0.31	0.26

Table 2: Effect of leaf extracts on fresh weight change (%) of cut gerbera cv. Ankur

Treatments (T)	Interval of Observations (Days)				
	2 nd Day	4 th Day	6 th Day	8 th Day	10 th Day
T ₁ -Neem leaf extract @ 1%	108.36	101.99	102.57	91.72	84.49
T ₂ -Neem leaf extract @ 3%	102.81	99.86	100.57	89.7	82.47
T ₃ -Neem leaf extract @ 5%	91.28	89.39	88.92	83.63	78.13
T ₄ -Seethaphal leaf extract @ 1%	101.42	94.44	97.23	88.93	81.64
T ₅ -Seethaphal leaf extract @ 3%	99.42	94.28	94.97	85.49	78.38
T ₆ -Seethaphal leaf extract @ 5%	92.65	89.2	86.7	75.86	68.62
T ₇ -Pongamia leaf extract @ 1%	110.42	112.21	99.7	91.6	83.42
T ₈ -Pongamia leaf extract @ 3%	95.16	83.19	91.22	88.19	80.99
T ₉ -Pongamia leaf extract @ 5%	91.44	85.9	87.58	81.72	74.65
T ₁₀ -Guava leaf extract @ 1%	103.71	94.28	99.54	89.18	81.16
T ₁₁ -Guava leaf extract @ 3%	104.16	99.97	96.53	86.56	79.43
T ₁₂ -Guava leaf extract @ 5%	93.24	89.24	85.69	74.84	69.42
T ₁₃ -Control (Distilled water)	97.01	94.89	92.79	77.83	70.59
Mean	95.19	94.53	94.15	85.02	77.95
S.E(m) ±	0.14	0.67	0.54	0.72	1.36
CD at 5%	0.43	1.41	1.89	0.99	3.61

Table 3: Effect of leaf extracts on scape bending curvature of cut gerbera cv. Ankur

Treatments (T)	Interval of Observations (Days)				
	2 nd Day	4 th Day	6 th Day	8 th Day	10 th Day
T ₁ -Neem leaf extract @ 1%	0.00	0.00	0.00	0.00	2.18
T ₂ -Neem leaf extract @ 3%	0.00	0.00	0.00	1.00	3.59
T ₃ -Neem leaf extract @ 5%	0.00	0.00	0.00	3.50	-
T ₄ -Seethaphal leaf extract @ 1%	0.00	0.00	0.00	0.00	3.33
T ₅ -Seethaphal leaf extract @ 3%	0.00	0.00	0.00	1.97	3.98
T ₆ -Seethaphal leaf extract @ 5%	0.00	0.00	1.83	3.13	-
T ₇ -Pongamia leaf extract @ 1%	0.00	0.00	0.00	0.00	1.20
T ₈ -Pongamia leaf extract @ 3%	0.00	0.00	0.00	1.17	4.40
T ₉ -Pongamia leaf extract @ 5%	0.00	0.00	0.00	3.07	-
T ₁₀ -Guava leaf extract @ 1%	0.00	0.00	0.00	1.23	4.20
T ₁₁ -Guava leaf extract @ 3%	0.00	0.00	0.00	1.30	4.23
T ₁₂ -Guava leaf extract @ 5%	0.00	0.00	1.63	3.03	-
T ₁₃ -Control (Distilled water)	0.00	0.00	1.50	3.00	-
Mean	-	-	0.38	1.72	-
S.E(m) ±	-	-	0.19	0.20	-
CD at 5%	-	-	0.54	0.59	-

Table 4: Effect of leaf extracts on vase life (days) and anthocyanin content (mg/g) of cut gerbera cv. Ankur

Treatments (T)	Vase life (days)	Anthocyanin content (mg/g)
T ₁ -Neem leaf extract @ 1%	12.67	7.13
T ₂ -Neem leaf extract @ 3%	11.67	6.62
T ₃ -Neem leaf extract @ 5%	9.67	6.26
T ₄ -Seethaphal leaf extract @ 1%	11.33	6.51
T ₅ -Seethaphal leaf extract @ 3%	10.00	6.35
T ₆ -Seethaphal leaf extract @ 5%	8.00	6.09
T ₇ -Pongamia leaf extract @ 1%	11.83	6.72
T ₈ -Pongamia leaf extract @ 3%	10.67	6.49
T ₉ -Pongamia leaf extract @ 5%	9.60	6.24
T ₁₀ -Guava leaf extract @ 1%	10.83	6.81
T ₁₁ -Guava leaf extract @ 3%	10.17	6.50
T ₁₂ -Guava leaf extract @ 5%	8.83	6.12
T ₁₃ -Control (Distilled water)	8.97	6.71
Mean	10.33	6.55
S.E(m) ±	0.57	0.01
CD at 5%	1.67	0.02

Conclusion

Among the different herbal leaf extract treatments evaluated, neem leaf extract at 1% proved to be the most effective in extending the vase life and maintaining the postharvest quality of *Gerbera jamesonii* cut flowers, closely followed by pongamia leaf extract at 1%. These treatments significantly enhanced water uptake, maintained fresh weight, reduced scape bending, and preserved higher anthocyanin content compared to control and higher concentrations of other extracts. The superior performance of neem and pongamia extracts can be attributed to their strong antimicrobial and antioxidant properties, which helped prevent microbial blockage in stem xylem, maintained cell membrane integrity, and delayed senescence. Thus, the use of natural leaf extracts particularly neem and pongamia offers an eco-friendly and sustainable alternative to synthetic chemical preservatives for prolonging the vase life of cut gerbera flowers.

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