REVIEW ARTICLE

ESSENTIAL OILS: A SUBSTITUTE FOR CHEMICALS IN ENHANCING VASE LIFE OF CUT FLOWERS

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Abstract: Cut flowers trade increased in recent years. Freshness of flowers for linger time after its removal from the mother plant is very important in flower industry. Vase life refers to the time period for which a cut flower retains its appearance in a vase. Vase life of cut flowers is mainly affected by two main factors, namely ethylene which accelerates the senescence of many flowers and by microorganisms which cause vascular blockage and thus reduces the vase life of cut flowers through reduced water uptake. Chemicals like 8-HQS, 8-HQC, $AgNO_3$, STS, TBZ, QAS, Al_2 (SO_4) are very important germicide used as preservatives in floral industry. These agents act as biocide (bactericide) and also are able to increase water uptake. Silver thiosulfate is in widespread commercial use to inhibit effects of ethylene and prolong vase life in many ornamentals. However, as silver is a heavy metal, it cannot be used on food and feed, and many countries prohibit its use. Keeping in view the environmental and safety issues in relation to above chemicals forced the scientist to look for good alternative substances for preservative solution of cut flowers. Essential oils are natural products taken from plant materials that, due to their antibacterial, antifungal, antioxidant and anti carcinogenic properties can be used as natural additives in many crops. Thyme, rosemary, geranium, coriander, Artemisia and mint account some of the aromatic and medicinal plants whose essential oils were tested and resulted in positive responses in post-harvest treatment of cut flowers .Recent studies reported usefulness of essential oils and herbal extracts for floriculture as noble alternative substitute to other silver and chemical compounds because of their antimicrobial activities and environmental friendly nature of the extracts.

Keywords: Cut flowers, Chemicals, Essential oil

INTRODUCTION

Keeping the freshness and beauty of cut flowers for a longer duration is crucial in cut flowers industry and is the main characteristic determining the commercial value of cut flowers. Among the major cause of vase life deterioration in cut flowers is reduced water uptake caused due to blockage in basal stem end and microbes which causes the stem end blockage. Another important cause is ethylene production which is ultimately responsible of wilting of petals. Several agents are being used in cut flowers for improving water uptake and to inhibit the ethylene production. To inhibit the ethylene production harmful chemicals like STS are being used in holding solutions. However, concerns have been raised about their environmental contamination characteristics. They are very difficult to remove from the environment and their high concentration can cause health problems. Environmental and health limitations due to above chemicals used in vase solutions encourage the scientists to find some safe and organic alternatives which can reduce toxicity in the preservative solutions for cut flowers industry.

Vase life of cut flowers

In floriculture industry longevity of cut flowers is very crucial. The vase life is estimated as post harvest duration of cut flower and long post harvest is beneficial for growers, traders and final users. Keeping this in view methods for higher vase life of cut flowers should be developed. To achieve the higher post harvest life of cut flowers, we have to understand the factors which deteriorate the post harvest life of cut flowers. Such understanding will help us to provide the required/modified conditions to cut flowers which will be ultimately helpful to improve the post harvest life. When flowers are harvested they start depletion carbohydrates because of ongoing metabolic activities. Water stress which leads to wilting, attack of microorganisms and high ethylene accumulation. All these factors deteriorate the harvested cut flowers (Gupta and Dubey, 2018). To overcome from these negative factors chemicals like 8-HQ compounds, STS etc. are being used. They are harmful preservative for human causing irritating to skin, eyes, respiratory tract and also pollute environment. Hence, identification of some new novel bio-molecules and botanicals are of prime importance for conserving our environment and to safeguard the human population from ill effects of hazardous chemicals.

Applications of essential oils for improvement of cut flowers vase life

Essential oil extracted from neem, clove, rosemary, lemongrass, eucalyptus etc. contains antimicrobial capacity against pathogens in vase solutions. There are several reports in the literature which proves the usefulness with no detrimental effects on horticultural product quality parameters when essential oils are used after harvest (Hegazi and Gan, 2009, Solgi *et al.*, 2009). Various essential oils were used in vase solutions to improve vase life of cut flowers and it was found that essential oils improve water uptake, relative fresh weight and freshness of

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cut flowers (Bayat *et al.,* 2013). Thyme essential oil (5%) improves the vase life of Narcissus flowers (Ali *et al.,* 2014). Vase life and solution uptake was increased in gerbera (*Gerbera jamesonii* cv. Dune') flowers with application of thyme oil, carvacrole and zataria oil (Solgi *et al.,* 2009). Application of artemisia oil (30%) enhances the vase life of chrysanthemum cut flowers Davood *et al*., (2013). Shahla and Davood, 2015 reported that essential oil of geranium (10%) when applied to vase solution resulted in 18 days vase life of cut chrysanthemum (*Dendranthema grandiflorum* L.). Postharvest vase life of cut chrysanthemum flowers was significantly improved with geranium essential oil (Hashemabadi *et al*., 2016). Various concentrations of artemisia oil enhance the vase life of cut chrysanthemum cv. White flowers (Zarchini *et al.,* 2013). Rosemary oil (200 mg/l) when applied to cut Lisianthus flowers (*Eustoma grandiflorum* L.) enhance the vase life up to 15 days (Kazemi *et al.,* 2014). Application of ajowan oil (500 ppm) in gladiolus cut flowers improves fresh weight and vase life (Marandi *et al.,* 2011). Antibacterial properties of ajowan oil were reported by reducing proliferation in the stem vessels of cut gladiolus flowers (Marandi *et al.,* 2011). Thyme and savory essential oil increased vase life in cut gladiolus flower (Mirdehghan, 2016).

Rosemary extract (25 %) when applied in cut carnation flowers cv. White Liberty enhance the vase life of cut carnation flowers up to 24.6 days. It was also reported that rosemary extract have antimicrobial effects that inhibit the growth of microorganism in vase solutions (Basiri *et al.,* 2011). Bayat *et al.,*(2011) while studying the effect of ethanol and essential oils of three medicinal plants namely thyme, summer savory and ajowan on extending vase-life of carnation cut flower cv. Yellow Candy reported that the effect of 4% ethanol used alone as a continuous or pulse treatment increased vase life and marketability of carnation. Essential oils at the concentration of 100, 150 and 200 ppm were investigated and summer savory essential oil (100 ppm) showed the highest effect (increasing vase life by 4.4 days) in comparison to the control. Results showed that there was no significant difference between application of essential oils alone and in combination with ethanol. The highest fresh weight was recorded in cut flowers treated with summer savory essential oil at 100 ppm after 6 days which was double compared to the control.

Yeganeh *et al.,* (2011) observed that 25% of rosemary extract was effective and increased vase life of cut carnation flowers (*Dianthus caryophyllus* cv. 'White liberty') up to 24.6 days under laboratory conditions. Kazmi and Ameri, (2012) reported that essential oils can be used successfully as preservatives for extending the vase life and to improve the quality traits in carnation. Application of essential oils and their biological effects on extending the shelf life and quality of horticultural crops and found that use of commercial wax coatings enriched with essential oils led to reduced fungal infection by pathogens. The use of essential oils can improve food safety by eliminating fungal spread, and they also leave no detectable residues after storage thus the innovative method of coating application proposed not only promotes crop moisture retention while maintaining quality, but completely eliminates the use of fungicide (Solgi and Ghorbanpour, 2014). Antimicrobial properties of the of *Thymus vulgaris* against seven common food-related bacteria and fungus namely *Staphylococcus aureus, Pseudomonas aeruginosa, Salmonella typhimurium , Escherichia coli , Klebsiella pneumoniae , Enterococcus faecalis* and *Candida* was repoted and can be used as a new source of natural antiseptics in the pharmaceutical and food industry (Bouraga *et al*., 2014).

Lavender, geranium, cumin and anise essential oils improves water uptake by reducing water loss and transpiration rate and ultimately enhance vase life of rose cut flower (Nermeen *et al.,* 2012). Essential oil obtained from various herbs like Piper, Annona, Curcuma, and Tobacco reduces the microbes in vase solution of rose cut flower (Jitareerat *et al.,* 2008). Piper extract (1%) delayed bent neck and ethylene production and maintained freshness of leaves in cut rose flowers. Rosemary essential oil significantly increased the diameter of Alstroemeria cut flowers. It was found that rosemary and peppermint essential oils contains high antimicrobial characteristics and reduces the amount of microorganisms in the solution. Rosemary essential oil also increases the freshness and quality of flower color and prevents the discoloration and reduces pigment in the petals of Alstroemeria cut flowers (Babarabie *et al.,* 2016). Highest vase life of 20 days was observed when ajowan essential oil (50 ppm) was applied to vase containing gladiolus cut flowers (Marandi *et al.,* 2011). Application of clove oil @ 500 ppm in gladiolus flowers resulted in maximum vase life (Hegazi and Gan, 2009). Studies showed that thyme, savory and ajowan essential oils can be used for enhancing vase life of gladiolus cut flowers as alternative to compounds containing silver and chemical preservatives.

CONCLUSION

It is evident from the above review that chemical preservatives being used to enhance the vase life of cut flowers are harmful to environment and humans involved in their handling. To replace such hazardous chemicals essential oils were found safer, cost effective and eco friendly. Essential oil prevents microbial contamination in vase solution which is helpful in continued water uptake and ultimately improves vase life of cut flowers. It can be concluded

from the studies that essential oils can be used as a noble alternative compare to other toxic chemical compounds in vase solutions for improving vase life of cut flowers.

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