

Effect of Holding solutions on vase life of Rose (*Rosa indica*) and Carnation (*Dianthus caryophyllus*)”

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Rosa hybrid is a member of the Rosaceae family, which includes around 150 species and 1400 cultivars (Elgimabi, 2011). The majority of rose species are native to Asia, however, a few species are found in Africa, North America, and Europe. Rose is a symbol of love and beauty all across the world. It is often used for decorating purposes in many types of functions because of its great aesthetic value. Rose is a woody perennial and thorny shrub whose fruit is known as hip or hope and contains a lot of vitamin C. The rose has been designated as the national flower of the United States and the United Kingdom. It was initially referred to as "The Queen of Flowers" by Greek poetess in her "Ode to the Rose" (Muhammad *et al.* 1996).

Roses are in high demand in both the domestic and international floriculture markets and are regarded as one of the most important cut flowers, ranking first in the global floriculture trade. Spain, France, South Africa, Italy, and India are the top rose producers. Roses are India's most popular commercial flower crop, accounting for about 90% of the country's total cut flower cultivated area. Except in a few areas like Pune and Bangalore, it is produced in greenhouses to ensure high-quality production. Cut roses are grown all over India, however, the primary cut rose growing states are Karnataka and Maharashtra followed by Tamil Nadu, West Bengal, and Himachal Pradesh. Only roses account for 99.5 percent of total cut flower exports from India. Orchids and carnations make up the remaining 0.5 percent (Geetha and Lissy, 2018).

When a flower is removed from a plant, complete with the stem, for display at exhibits or other uses, it is referred to as a "Cut Flower." On the worldwide market, demand for cut flowers is increasing at a pace of 10-15% each year (Singh *et al.* 2001). Roses are stunning cut flowers that are used in floral arrangements and dried flower crafts. Rose flowers may be found in a variety of colours virtually anywhere in India. Cut roses play an important part in a variety of social occasions and daily activities due to their wide colour range and widespread availability in the market. Roses are popular as cut flowers because of their vibrant petal colors and intoxicating scents. On important occasions, rose flowers are used to make bouquets. Even a single rose stick is in high demand, particularly around Valentine's Day, Mother's Day, and Easter. Rose flowers are given as natural presents on anniversaries, and they are also utilized for worship in religious settings in loose form.

Rose plants are mostly valued as cut flowers, which has a significant impact on the floricultural industry (Butt, 2003). Roses have great economic worth since they are utilized in cosmetics and fragrances as raw ingredients. Rose is used to making essential oil, rose water, and rose flowers. The global cut flower trade is estimated to be worth Rs. 75000 crores each year, with a 19% increase in total shares (Jain, 2005). Rose is renowned as the "Queen of Flowers," yet its vase life is limited. Rose is a popular cut flower in both the domestic and international floriculture markets. Rose is the most popular flower in the world. Spain, France, South Africa, Italy, and India are the main rose-growing countries. The rose is India's most significant commercial flower crop. In India, cut roses are cultivated in a variety of states and regions, with Karnataka and Maharashtra being the most prominent, followed by Tamil Nadu, West Bengal, and Himachal Pradesh. Vase life refers to the amount of time that a cut flower or cut foliage retains its look and aesthetic value in a vase. For rose growers, vase life and cut flower keeping quality are extremely important and cost-effective. Senescence and vase life of cut flowers is influenced by physiological processes that occur in the leaves, stem, flower bud, leafless peduncle, or scape linking the bud to the stem. The main focus of the study is to extend the vase's life and improve the vase's keeping quality. Cut flower vase life is affected by a variety of variables including air, water, and microbes like fungus and bacteria.

One of the most popular cut flowers is the carnation (*Dianthus caryophyllus* L.). Carnations have $2n=30$ chromosomes and are members of the Caryophyllaceae family. Carnation is a perennial herbaceous plant that is partly hardy. Carnation is a Mediterranean flower that is native to the area. Spain is said to be the carnation's birthplace. Because of their exquisite shape, variety of hues, long vase life, and lightweight, carnations are highly popular cut flowers. Carnation gets its common name from the Latin word carnation-carnis. The two main varieties of carnation are 'standard' and 'spray.' Standard carnations feature larger blooms and longer flower stalks, but spray carnations have a higher number of smaller flowers and a weaker stem. It is the first cut flower to be produced commercially in the tropics at high altitudes for export to North America and Europe. Many nations, including Holland, Kenya, the Canary Islands, Spain, the Netherlands, Italy, Columbia, and the United States of America, produce it commercially. Carnation cultivars for cut flowers are chosen based on bloom size, petal number, stem length, postharvest lifespan, and disease resistance (Vilas *et al.* 2017).

Cut flowers, bedding, pots, borders, edging, inside, and rock gardens are all popular uses for carnations. Carnations are a cut flower that is used in bouquets to convey our sentiments or for various events. For important events such as Valentine's Day, Easter, Mother's Day, and Christmas, carnations are in great demand. The ability to utilize little carnations in flower arrangements is gaining popularity. Carnations are often used to decorate for special events such as Mother's Day and weddings (Nowak and Rudnicki, 1990). Carnations were also known in ancient Rome as "Jove's flower," a tribute to one of their favorite gods. Carnation comes in a variety of hues, each with its significance or connotation. Gratitude is symbolized by the pink carnation. On Parents' Day in Korea, red and pink carnations are used to express love and admiration for parents. Pink carnations represent a mother's, unwavering love. On Mother's Day, red carnations are worn if one's mother is alive, while white carnations are worn if she is not. Carnations are often given to teachers on Teachers' Day to demonstrate their respect and gratitude (Satoh *et al.* 2005).

One of the most important factors in determining the quality of a cut flower is its vase life. Because the demand for fresh cut flowers is increasing day by day, it is necessary to transport



the flowers across great distances in good condition. As a result, adequate transportation facilities, appropriate packing materials, and preservative chemicals are required to protect the quality of cut flowers. Chemical preservatives must be added to cut flowers to extend their vase life. Sugar as a respiratory substrate, a germicide to inhibit harmful bacteria, and an acidifying agent must all be included in any preservative solution (Nair *et al.* 2003).

Sucrose improves water balance in cut flowers by affecting stomatal closure and water loss reduction (Marousky, 1971). Sucrose in the vase solution affects water absorption, water loss through transpiration, and maintains better water relations, resulting in increased fresh weight of the flower (Bhattacharjee, 1998). Carbohydrate and sucrose are required for the growth of flower buds for them to open (Pun and Ichimura, 2003), as well as structural material and carbon skeletons for bud opening (Mayak *et al.* 1973). Sucrose treatment increased the unfolding of petals, inhibited the development of petals senescence, and suppressed the reduction in fresh dry weight of cut flowers (Ichimura *et al.* 2003). Sugar treatment improves the expression of floral colour in some cut flowers like carnations and roses, according to reports (Parups and Molnar, 1972). Sucrose binds to the tissues of flowers, increasing their osmotic concentration and increasing their ability to absorb water and maintain turgidity. Sucrose extends the vase life and quality of cut flowers, but it also boosts microbial activity. Antimicrobials should be used in conjunction with sucrose in preservation solutions to combat bacterial activity (Mir *et al.* 2013). Several techniques are used to extend the vase life of cut flowers and keep them fresh for extended periods. Cut flowers should be free of deterioration, as one of the main access sites for decay organisms is through the stem. The obstruction of xylem vessels by air and bacteria, which causes xylem occlusion, is a primary cause of degeneration in cut flowers (Hardenburg, 1968). The most prevalent type of silver salt used in commercial floral preservation solutions is silver nitrate (AgNO_3), which is primarily employed as an ethylene binding inhibitor. In rose-cut flowers, pulsing with (AgNO_3) greatly increases vase life and solution absorption (Singh and Tiwari, 2002). Cut roses were pulsed for 10-20 minutes with AgNO_3 to extend vase life to 6.0 and 5.3 days, respectively (Reddy *et al.* 1988).

The usage of 8-HQC in cut flowers is well known since it serves as a bactericide to extend the vase life of cut roses, while AgNO₃, which acts as an anti-ethylene, also contributes to increased flower diameter and vase life. The amount of bacteria in stems is controlled using an 8-HQC solution. In the flower business, 8-hydroxyquinoline citrate (8-HQC) is a common and effective germicide (Butt, 2005). As a result, adding 8-HQC in vase solution or as a pulse would reduce microbial development and vascular obstruction, promoting water absorption (Chand *et al.* 2012). 8-HQC is well-known in the cut flower industry because it serves as a bactericide to extend the vase life of cut roses, while AgNO₃, which acts as an anti-ethylene, also increases flower diameter and vase life. 8-HQC improves floral vase life by acidifying the water, which is thought to minimize enzymatic activity and xylem degradation while boosting solution absorption (Marousky, 1971).

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