CHRYSANTHEMUM

Other Names

Mums, chrysanths, chrysanthos, florist's chrysanthemum

Taxonomy

Chrysanthemum x *morifolium* (Ramat.) Hemsl. (florist's chrysanthemum), Asteraceae.

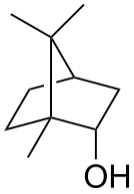
Botany

Chrysanthemums are one of the most widely cultivated flowers in the world and ranks second after roses in popularity. The name "chrysanthemum" comes from the Greek words "*chrysos*," which means "gold," and "*anthemon*," which means "flower." This is because the original chrysanthemum flower was yellow or gold in colour. The flower is often associated with Japan, where it is considered a symbol of the autumn season and is featured prominently in art, culture, and festivals. The florist's chrysanthemum hybrid originated in SE China. It is a popular ornamental plant with colourful and showy flower heads and has been cultivated for over 2,500 years before they were introduced into Europe in

the 18th century. This hybrid has more than 100 cultivars with colourful flower heads in a wide range of shapes and sizes, ranging from large single-headed standard types to the more popular spray types with small flowers. The multi-petaled blooms of the spray types can be arranged in various forms including single or fully double with forms resembling daisies, pompoms (pompons), quills, spoons or spiders. The flowers may be white, yellow, pink, red, orange, or purple in colour and are often marked with contrasting colours or stripes. The mildly aromatic foliage is usually dark green, alternately arranged and deeply lobed, giving the plant a lush, full appearance.

The aroma of florist's chrysanthemum leaves comes from the presence of essential oils, which are natural aromatic compounds found in the leaf tissues. The main constituents of these oils include terpenes, phenols, and ketones. The exact composition of the essential oils can vary depending on the cultivar and environmental factors such as temperature, humidity, and soil type. Some of the most common aromatic compounds found in chrysanthemum leaves include camphor, eucalyptol, thujone, and borneol.

Camphor



Borneol

Although florist's chrysanthemum is a perennial herb, these chrysanthemums are often grown as perennials or annuals, depending on the climate. They are commonly used in flower arrangements, as cut flowers, or as potted plants for indoor decoration.

Harvesting and Quality Indices

Harvesting chrysanthemums at the right time is crucial to ensure optimal quality and longevity. Standard chrysanthemum flowers should be harvested when fully open, or nearly so. However, they can be harvested at the 'tight bud' stage (about 5 cm in diameter) provided they are placed in a suitable bud-opening solution, such as a good flower food solution containing sugar and a suitable germicide, soon after cutting. Buds cut tighter than 5 cm usually fail to open. Tight bud flowers have a longer vase life and will continue to open once placed in water. The flowers should have a uniform colour and be free from any spots or discoloration. In some cases, certain varieties of chrysanthemums may have more value if harvested at a specific colour stage. The stem of chrysanthemums should be at least 30 cm long to ensure that they can be used for a variety of floral arrangements. Spray varieties can be harvested when most of the petals of the most mature flowers are still upright. The flowers can then be rehydrated and opened in a rehydration solution after dry storage or transportation. Harvesting should be done with sharp, clean cutting tools. A dull blade can crush the stems and damage the

delicate tissue, while a dirty blade can introduce bacteria that can block the stem and cause the flowers to wilt more quickly. Stems should be cut about 10 cm above the growth medium to keep clear of woody older stem tissue and the leaves should be removed from the lower third of the stem. Freedom from damage, disease, and defects as well as stem length, weight and strength, freshness, firm petals and no signs of wilting in the flowers or leaves are important quality criteria for chrysanthemums.

Postharvest Care

Chrysanthemums should be harvested during cooler times of the day to avoid heat stress and wilting. Once harvested, the flowers should be immediately placed in clean water containing a germicide such as sodium hypochlorite and kept in a cool environment to maximize their vase life. A rapid dip of the stem end in a 1000 mg/L silver nitrate solution also guards against bacterial contamination. However, this treatment can cause browning of the stem end. Proper rehydration is vital for good vase life of chrysanthemums that have been stored dry or shipped long distances. Remove chrysanthemum bunches from the boxes, re-cut stem bases (remove about 2.5 cm) and place in a good rehydration solution for at least 2 hours until turgidity is restored in the flowers and foliage.

Precooling, Storage and Packing

Precooling and proper storage of chrysanthemums are important to maintain their quality and prolong their vase life. Chrysanthemums should be pre-cooled immediately after harvesting to 0-2°C to reduce the respiration rate and delay the onset of senescence. Precooling time varies based on the cultivar, but typically ranges from 2 to 4 hours.

After precooling, chrysanthemums should be stored at 1-3°C and 80-90% relative humidity to maintain their quality. Higher temperatures can lead to wilting and discoloration, while lower temperatures can cause damage to the flowers. High humidity helps to prevent dehydration and wilting, while low humidity can cause the flowers to dry out. Adequate ventilation is important to prevent the build-up of carbon dioxide and ethylene. Good air circulation can also help to maintain the humidity level in the storage area. Chrysanthemums can be stored for up to 2 weeks under proper conditions, but the length of storage varies depending on the cultivar and storage conditions.

Proper packing of cut chrysanthemums is important to ensure that they arrive at their destination in good condition. Use sturdy, leak-proof fibreboard boxes or containers that are designed for transporting flowers. The containers should be able to withstand the weight of the chrysanthemum stems and protect them from damage during transport. Use tissue paper or a protective wrap to cover the flowers and prevent them from rubbing against each other during transport. This will help to prevent damage to the petals and maintain their appearance.

Vase Life

The vase life of chrysanthemums can vary depending on the cultivar, growing conditions, and how they are handled and cared for after being cut. However, on average, chrysanthemums have a good vase life ranging from 7 to 14 days. Vase life is affected by factors such as the age of the flowers, temperature, water quality, stem length and humidity. Chrysanthemums that are cut when they are fully mature but before the flowers start to open have a longer vase life compared to those that are cut when they are fully open. Since chrysanthemums prefer cooler temperatures, it should be kept in a cool environment to prolong their vase life. The vase water should be clean and fresh to facilitate sufficient water uptake. Stems should be cut at an angle and any leaves that will be submerged in the water should be removed. Longer stems allow the flowers to take up more water and nutrients, which can prolong their vase life.

Ethylene

Chrysanthemum flowers do not produce ethylene and are not sensitive to the hormone. However, ethylene can cause yellowing of the foliage due to the destruction of chlorophyll.

Physiological Disorders

Cut chrysanthemums can develop various physiological disorders that affect their quality and vase life.

Bent neck: This disorder occurs when the stem of the chrysanthemum droops or bends near the base of the flower, making it difficult for the flower to take up water. It is caused by blockage of the xylem vessels, which transport water and nutrients from the stem to the flower head. Bent neck can be prevented by cutting the stem at an angle under running water, avoiding damage to the stem, and providing adequate water in the vase.

Leaf yellowing: Cut chrysanthemum flowers can develop yellowing or browning of the leaves, which can reduce their aesthetic appeal. This disorder is caused by the accumulation of ethylene. To prevent leaf yellowing, it is important to handle chrysanthemums gently, avoid exposure to ethylene-producing sources such as fruits and cigarette smoke, and change the vase water frequently.

Wilting: Wilting is a common disorder of chrysanthemums. It occurs when the flowers lose their turgor pressure and begin to droop or wilt. Wilting can be caused by factors such as water stress and high temperature. To prevent wilting, it is important to provide adequate water and nutrients, and maintain a cool temperature.

Petal discoloration: Cut chrysanthemum flowers can develop discoloration of the petals, which can affect their appearance. This disorder can be caused by various factors, such as exposure to sunlight, high temperature, and chemical damage. To prevent petal discoloration, it is important to handle chrysanthemums gently, avoid exposure to direct sunlight and high temperature, and use only recommended floral preservatives.

Postharvest Pathology

Chrysanthemums can develop various postharvest diseases that can affect their quality and vase life. To prevent these diseases, it is important to use disease-free planting material, handle chrysanthemums gently, maintain a dry and well-ventilated environment, and use recommended fungicides and bactericides when necessary.

Botrytis cinerea: This fungus is the most common postharvest pathogen of chrysanthemums. It causes gray mold, a disease that affects the flowers and leaves, causing them to rot and develop a gray, fuzzy appearance. *Botrytis cinerea* thrives in humid conditions and can infect chrysanthemums through wounds or damaged tissue. To prevent gray mold, it is important to handle chrysanthemums gently, maintain a dry environment, and use recommended fungicides.

Fusarium oxysporum: This fungus causes wilting and leaf yellowing of chrysanthemums. It enters the plant through the roots and colonizes the vascular system, preventing the plant from taking up water and nutrients. To prevent Fusarium wilt, it is important to use disease-free planting material, avoid overwatering, and use recommended fungicides.

Alternaria spp.: This fungus causes leaf spots and blight in chrysanthemums, leading to premature leaf drop and reduced flower quality. It thrives in humid conditions and can infect chrysanthemums through wounds or damaged tissue. To prevent Alternaria leaf spot, it is important to handle chrysanthemums gently, maintain a dry environment, and use recommended fungicides.

Pseudomonas spp.: This bacterium causes bacterial blight in chrysanthemums, leading to brown or black spots on the leaves and flowers. It thrives in humid conditions and can infect chrysanthemums through wounds or damaged tissue. To prevent bacterial blight, it is important to handle chrysanthemums gently, maintain a dry environment, and use recommended bactericides.