

Some of the indigenous species do not take well to transplanting once the seedling begins to mature. The polystyrene trays should be treated with Styrodip to prevent the roots growing into the walls of the trays. The more robust healthy seedlings can then be selected to plant into bags or pots and the others discarded. Other benefits of planting into trays are that it takes a skill which not all people have to handle and transplant the small seedlings. With minimum training anyone can plant a plug. Also the seedlings can stay in the trays for up to 3 years, which with the erratic supply of seed, can be an added bonus of planting up more than you need in a bumper year to ensure a constant supply of a species.

CONCLUSION

A big part of the pleasure I derive from the nursery is the propagation of rare and endangered species. This, I feel, is a worthwhile cause because at the rate of development and habitat destruction in this country cultivation may be a plant's only chance of survival and I feel privileged and blessed that I can be a part of that. The cultivation of a wide variety of indigenous plants, for which no information is available, requires a lot of experimentation to overcome problems with regard to sourcing and cleaning of seed, timing of germination, breaking of dormancy, transplanting, and other challenges.

Production of Quality Export Chrysanthemum Cuttings

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Propagation of chrysanthemum by means of cuttings is an operation that is carried out by specialized cutting producers. Because of the competitiveness in the chrysanthemum industry, quality is of utmost importance for the cutting producer. Quality of cuttings is determined by: cultivar choice, evenness, presence or absence of pathogens and insects, size, vigor, vegetativeness, age of mother plants, and package and conditions during transport. A chrysanthemum cutting producer should continuously check all steps and conditions during propagation. Samples of cuttings should be inspected by independent workers and a bonus and penalty system which is based on the result of the inspection resulted in an increase in productivity and quality at Van Zanten, South Africa.

INTRODUCTION

Chrysanthemums (*Dendranthema ×grandiflorum*) are the second largest selling cut flower, with large amount of production in Japan, Holland, South America, and other countries.

Chrysanthemums are grown from cuttings and the flowers are harvested approximately 11 weeks after planting. Because the end product is rather heavy and with a limit on the selling price it is not economically viable to export it over long distances by air.

It is very costly to produce cut flowers because of:

- Climate control (temperatures between 17C minimum and 35C maximum).
- Day length control (long days for the vegetative stage and short days for the generative stage).
- Extensive spraying programs including fungicides, insecticides, and growth regulators.
- Capital layout.
- Cost of labor.

Due to these factors, chrysanthemum production in Holland has changed considerably during the last couple of years. The average growing area per grower has increased from 1 to 4 ha. Only modern greenhouses with a high level of mechanization and automation are used. It is, therefore, obvious that all growers expect only propagation material of the highest quality. In the cutting market a successful trader will have to ensure that its cuttings are of high quality.

Quality in this case, is all the visual, genetic, and physiological factors to which cuttings must comply and which are required to grow the crop successfully. In chrysanthemum, the required quality norms override the cost aspect. If the product falls short of the required quality norms, you will not be able to sell your cuttings regardless of the price. It is, therefore, of paramount importance that a cutting supplier maintains very strict and high quality standards.

FACTORS AFFECTING QUALITY

Cultivar Choice. Literally hundreds of chrysanthemum cultivars are available from a number of international breeders. However, the choice for the cut flower grower is determined primarily by what the market wants. Growers of cut chrysanthemums often rely on propagators to advise them with regard to suitable cultivars. The propagator must thus make sure to provide the correct advice relating to:

- The ease by which the grower can grow a specific cultivar in his/her nursery.
- The infrastructure required because some cultivars require strict environmental control.
- Season of the year.
- True to color and not mixed with other colors.
- Evenness in growth and flowering.

Virus-free. Viruses, such as Tomato Spotted Wilt Virus, are transmitted by insects, while other viruses, such as the stunt viroid, are dormant within the mother stock and can become active as the plant grows. Therefore, it is necessary to inspect the mother stock twice a week and remove any suspicious plants. This is a specialized task and requires a person with knowledge of the problem. A virus can be spread by hand during harvesting of cuttings or by sucking insects. If the infestation exceeds 5% of the mother stock, the planting should be replaced.

Generation. Because of the fact that irradiation is used in the breeding process, cuttings for mother stock should not be used which are older than the fourth generation of the original in-vivo mother stock.

Vegetative Stage. Because chrysanthemum is a short-day plant, the mother stock must always be in the vegetative stage. Precocious flower formation is a disaster and will have the effect that growers will be handing in claims determined on the ruling market price, less a portion of the production costs. Mother stock is kept in the vegetative stage by means of interrupted lighting from 19h00 to 05h30. It is important that the lighting installation is checked daily and controlled. Most growers use a method whereby the number of exposures are recorded by a counter and as a safety measure, are checked at night. It is also important that the grower insures that he/she maintains a radiation level of approximately 85 lux during lighting stages on the mother stock.

Age of the Mother Stock. Some cultivars have a short “long-day leaf number”; this means that although you have lighting on, the mother stock eventually turn generative. To counter this effect, the mother stock should preferably not be kept in production for longer than 14 weeks.

Climate. Extreme temperatures will have negative effects on the production of cuttings. The norms are between 18C minimum and 35C maximum. If the temperatures in the greenhouse drop below 18C, most cultivars will not form buds or will form uneven buds. High temperatures will have the effect that certain cultivars set buds precociously due to increased stress. To ensure good quality, you need to have a good and effective heating and cooling system present to manage climate control.

Free from Insect and Fungal Infestations. The mother stock must always be free of insects and fungi infestations. No cuttings will be allowed to be imported into another country with any of these infestations present. A strict spraying program is therefore of paramount importance, whether it is preventative or corrective. Spraying is done twice weekly and chemicals should be rotated regularly to avoid the build up of resistance. It is important to spray early in the morning to avoid spray damage on the leaves. Although insect-damage can be diagnosed on the mother stock, sticky traps should be placed in the greenhouse to monitor the presence of mature insects.

Size. Size and leaf surface of cuttings must be even. To obtain this, cuttings must be harvested 5 times in a 14-day cycle. The cuttings are mostly picked at 5.5 cm length (bottom of stem to bottom of growth tip). Cuttings that are harvested too old, will be too thick and cuttings harvested too young, too thin. Thick cuttings grow faster than thin cuttings and this will result in an uneven crop for the cut flower producer.

Vigor. Cuttings must root well within 12 to 14 days to form a rooted plant which will flower within 10 to 11 weeks after planting. To ensure strong growth of the mother stock, the fertigation and irrigation program will be determined by the soil analysis and macro- and microelements and the moisture content present. If the feeding and the irrigation are not optimal at all times, cuttings will either be too hard or too soft, which can cause problems during rooting. Growers in The Netherlands, where light intensity is relatively low, root cuttings with 6 to 7 developed leaves on the cutting. Optimum growth of the motherstock will ensure good quality cuttings.

Package and Transport. After cuttings have been harvested in the greenhouse, they must be placed in the coldroom within 1 h to avoid deterioration due to extreme heat conditions. The quicker the cuttings are cooled to 2°C, the longer the quality will be maintained. The cuttings must be packed in bags not only to avoid damage, but also to ensure quick and easy handling of the cuttings during the planting process. Condensation must be removed from the bags in the coldroom to avoid rotting in the boxes while in transit. Aircraft temperature can not be kept at 2°C and runs up to ±27°C. It is thus important that the packing must be well insulated to avoid temperature increase. High temperature during transport affects the shelf life and rooting ability of the cutting negatively.

CONCLUSION

To ensure quality, the chrysanthemum cutting producer has to check and recheck all the steps in the production process continuously. The grower must also receive feedback from the buyer on a weekly basis. To ensure that cuttings conform to the requirements with regard to size and evenness, samples should be drawn from the cold room continuously by independent controllers and checked. It is our experience that a bonus and penalty system, which is based on the result of the quality control process, resulted in a marked increase in productivity and quality. An additional benefit is that it has also resulted in harvesters being able to increase their monthly salary.