
International Journal of Advanced Research in Biological Sciences

ISSN : 2348-8069

www.ijarbs.com

Review Article



Helianthus annuus: A Potential Cut Flower in Botswana

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Abstract

Helianthus annuus an annual erect herb 4(-5)m tall grown for oil extraction and as a forage crop. In last decade the sunflower has been used as an ornamental plant and cut flower also. Sunflower use as a cut flower not been exploited in Botswana; grown sunflower for oil extraction and forage. The dry climatic conditions of Botswana favoured the growth of sunflower as drought tolerant crop. The rainfall requirement ranges from 500 to 1000 mm and Botswana rainfall ranges from 650 mm in the extreme north east to 250 mm in the extreme south west. Sunflower compared to other crops performed well under drought conditions; probably the main reason for the crop's popularity in the marginal areas of South Africa. Taproot system penetrating upto 2 m enabled the plant to survive from water stress. In Botswana the summer temperatures vary from ~12-15°C during the early morning, to ~30-40°C by late afternoon in the hot, dry season (generally from mid September to late October), but the maximum temperatures remain ~25-30°C, during the rainy season. Ornamental sunflowers relatively easy to grow, consumers liked them and attractive for growers to include in their production schedules.

Keywords: Sunflower, Botswana, cut flower, oil extraction and forage

Introduction

Sunflowers (*Helianthus annuus* L.) are native to North America where they were grown by indigenous people for food and medicinal purposes (Putt, 1978). The annual sunflower belongs to the *Compositae* or *Asteraceae* family (Heiser, 1978). In early 1990's sunflowers regained popularity as highly marketable crop; increasing economic importance and specialty in cut flower business (Devecchi, 2005; Celikel and Reid, 2002; Yañez *et al.*, 2005). According to Devecchi (2005) sunflowers had shifted from 35th to 18th rank in the Dutch flower auction between 1994 and 2000. The development of new cultivars offered a wide range of flower colors that were one of the most important reason for revival of sunflower (Armitage and Laushman, 2003; Fanelli *et al.*, 2001). The availability of sunflowers year round was another reason for their popularity (Armitage and Laushman, 2003). This crop was easy to grow and adapted to an array of climatic and soil conditions (Armitage and

Laushman, 2003; Fanelli *et al.*, 2001; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). Sunflower was grown in semi-arid regions of the world from Argentina to Canada and Central Africa into the Soviet Union. The growth in the appreciation of cut flowers in Botswana had lead to need for plant resource and varieties that would survive the environmental conditions yet expressing their full genetic potential.

Cut stems

Sunflowers have long stems when harvested, but the stems are cut several times during the distribution chain. This is done to avoid xylem occlusion in the basal stem end, and to adapt stem length to the use of the flowers in bouquets. Around 1990, the Japanese introduced F1 hybrid sunflowers that did not shed pollen (Armitage and Laushman, 2003; Schoellhorn *et al.*, 2003; Sloan and Harkness, 2006). This made

sunflowers more attractive to department stores, mail-order sources and high-end designers, who no longer had to worry about the mess left by the pollen shedding cultivars (Schoellhorn *et al.*, 2003; Sloan and Harkness, 2006). Many cultivars had been launched for cut flower use, with a wide variety of colours ranging from yellow to bronze, red or cream, as well as different flower shapes (Armitage and Laushman, 2003; Stevens *et al.*, 1995; Schoellhorn *et al.*, 2003).

Climatic conditions

Sunflowers adapted to any array of soil types and climatic conditions, but performed better in full sun and well-drained soil (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). The crop requirement of soil pH was in the range 6.5 -7.5, a near- neutral. Preferably, annual sunflowers should be started in plug trays of 72 cells, 2-3 weeks before planting, but seeds can be sown directly in the field after the last freeze (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). This crop is drought tolerant, but performed better when it was stressed for water (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). Insufficient water supply at vegetative stages of sunflower may delayed flowering and reduce the number of flowers per head. Lack of water resulted in reduced production and quality, less inflorescence, lack of colour and shorter post harvest life (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003).

Excess water caused lack of growth and promote root rot disease (Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). Overhead irrigation physically damaged the flowers by causing spotting on the petals, and helped spread soil borne diseases onto the foliage (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). Drip irrigation highly recommended for cut flower production to avoid flower and foliar damage (Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003).

Postharvest handling

Consumer demanded sunflowers in recent years, but there was little information about postharvest management of cut flower. The stage at which

sunflowers were harvested directly related to postharvest management practices after the stems cut (Armitage and Laushman, 2003; Dole and Wilkins, 2005). If the stems sold directly from the field at a farmers' market or local grocery store, should be harvested with a completely open flower (Armitage and Laushman, 2003; Dole and Wilkins, 2005). Cut stems should be placed in sanitized buckets with clean tap water if possible; a hydrating solution should be added to the water (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). Sunflower stems stored for an extended period of time, prior to sale, should be harvested in the cup stage, when ray flowers begin to unfold from the centre of the inflorescence, and the flower head viewed from the side looks like a cup (Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). Harvesting should be occurred in cooler hours of day, preferably in morning, when the plants and the flowers were free from dew and moisture (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). Harvest containers and cutting utensils should be cleaned and disinfected prior to harvest (Armitage and Laushman, 2003).

The sunflower stems should be cut as long as possible from the field (Armitage and Laushman, 2003). Stems can be re-cut in the postharvest area to a desired length, and all foliage must be removed to decrease transpiration, as well as to avoid disease proliferation in the postharvest area (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). In postharvest area, stems can be graded by length and thickness of the stem and the size of the flower (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). Sunflower stems may be bunched, depending on buyer specifications, and stored at 2-4°C and 85-95% relative humidity for up to a week (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003).

Sunflowers do not benefit from floral preservatives (Armitage and Laushman, 2003). It is recommended to use a hydrating solution or an antibacterial solution to prevent proliferation of bacteria in holding water and inside the stem, stimulated water uptake and avoided the clogging of vascular system (Armitage and Laushman, 2003; Dole and Wilkins, 2005; Stevens *et al.*, 1993; Schoellhorn *et al.*, 2003). Postharvest

longevity of sunflowers may vary depending on the cultivar; cut sunflower may last from 5-13 days with an average of 8 days (Gast, 1995).

Sunflower as cut flower in other regions

Participants in Association of Specialty Cut Flower Growers on-farm evaluations reported that some upright sunflower cultivars were too large for florist usage, while other cultivars branched too freely and produced stems and flowers that were unacceptably small (Dole, 2002, 2003). In another trial, many upright sunflower cultivars grown in Mississippi field beds produced stems and flowers that were too large for general florist use (Sloan and Harkness, 2006). Emino and Hamilton (2004) attempted to reduce stem and flower size of sunflowers by removing the terminal bud. They reported that pinching “Sun bright” 3 weeks after planting produced a uniform crop of 91cm long stems, while the non pinched stems grew to 152 cm. Another trial reported that spacing “Superior Sunset” plants 7.6 cm within the row, compared with 15 cm or 23 cm was necessary to reduce stem size (Sloan *et al.*, 2004). Florists in Tupelo, Mississippi, indicated that the desirable sunflower stem size for general floral arrangements would be 60-90 cm long and 0.5-1.5 cm wide; the ideal flower would be 8-15 cm in diameter (Sloan and Harkness, 2006). Sloan *et al.*(2004) reported that pinching the branching cultivars in the 6 to 10 node stage in May-June planting period, and then pinching at the 4 to 8 node stage later in the growing season (July-August) produced 4-7 stems ranging 83–95cm long and 1.0-1.1cm in diameter. These dimensions were within the suitable size ranged for sunflower stems. Planting date had greater effect on stem length and diameter of upright cultivars than choice between 4-, 6-, 8-, or 10-node pinch treatments, possibly due to increasing temperatures from May to August in Mississippi. This research indicated that removal of the terminal bud of upright sunflowers in the 4- to 10-node stage of growth resulted in the production of 3–7 stems were 64-131cm long and 1.0-1.8 cm in diameter, which are within established, acceptable size ranges (Sloan *et al.*, 2004). Botswana as reported by FAO (2000) received maximum rainfall 600-750 mm which Van der Vossen *et al.*, (2007) reported that with a supplementation of irrigation can be resulted in considerably higher yields in sunflower.

Conclusion

The production of sunflower in Botswana proves to be a potential enterprises taking into consideration the local climatic conditions and the general requirement of the plant.

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