



Safflower in European floriculture: a review

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Abstract

Safflower exploitation in European floriculture rapidly increased during the last two decades of the last century. In the year 2000, 35.2 million flowering stems were supplied to the VBN (Dutch cooperative flower auctions) and the total value of sales in that year reached about € 5.3 million, so that safflower was ranked 39th among all cut flowers in terms of its commercial importance. At the time it was ranked 19th among imported cut flowers, with a sales value of nearly € 2.6 million. However, from 2001 onwards, flowering stem production and imports of safflower appear to have decreased and currently safflower is ranked 59th with a total sales value of only € 3.4 million (19.2 million stems sold). Today, twenty cultivars are grown for ornamental purposes, although over forty varieties have been offered and subsequently rejected in the last decade. Spineless races of safflower are available as late cultivars only, grown mainly outdoors for dried flower production. Early varieties recommended for greenhouse fresh flower production remain weakly spiny. Safflower varieties are still important for the flower trade, but further breeding work seems to be necessary with the current cultivars.

Key words: safflower - cut flowers – VBN - sales value – cultivars - greenhouse production - dried flowers

Introduction

Safflower is a multi-purpose plant cultivated since ancient times not only for its dyestuff content in flowers, oil in achenes, and for medicinal activity its substances but for floristic purposes were a fulgent inflorescence also exploited long ago. In Egypt, antique safflower wreaths were applied at sepultures. Seed companies E.C.K. Wrede and J. Moos were offered safflower seeds for gardens as early as the beginning of the nineteenth century, and many authors reported about the cultivation of safflower in flower gardens in their times. But in professional horticultural literature safflower is mentioned as exception only: in larger scale, its importance is increasing as a consequence of higher demand for dried flowers in the last two decades of century.

Statistics

Two decades ago, safflower was newly presented in professional articles in horticultural periodicals (Hegele, 1985, Hartrath, 1986). Popularity of safflower was growing to the end of the last century. In 1990, safflower was placed at 46th position among the cut-flowers in Holland auctions already, with annual sales around 3,122,000 Hfl (1,419,000 €, approximately). Nine years later it ranked 37th, dropping to 39th in 2000, but annual sales trebled to 5,321,000 € (table 2). Import covers a demand nearly with 50 per cent but among imported cut-flowers was safflower placed at 19th position by that time. Nevertheless, surprising is not only the amount of harvested flowering stems (47,021,000 in 1999, 35,198,000 in 2000, and still 35,626,000 in 2001), but the fact that safflower walked over more popular annual cut-flowers, such as snapdragons, asters, celosias, gomphrenas, or marigolds at that time (table 3). However, from beginning of this century both European production and import of safflower flowering stems seems to be gradually decreasing: in 2005, safflower was placed at 55th position with annual sales 3 772 000 €, and last statistics ranked it 59th with annual sale around 3,382,000 € only (table 2). Together, import dropped by 45 per cent and among the imported cut-flowers, safflower turned to 47th position. Among the varieties, orange-flowered 'Zanzibar' with 14 429 350 flowering stems substitute nearly 70 per cent of total safflower annual sales, followed by 'Summersun' (681 100), 'Orange Grenade' (650 165), and 'Kinko' (453 080 flowering stems).



Outdoor cultivation

In outdoor areas, where safflower is cultivated especially for drying, its cultivation is essentially consistent with the techniques applied by farmers during the cultivation for industrial use. They generally recommended a sowing rate of 200-300 grams per 100 square meter, with rows spaced at 0.3 m (Hegele, 1985; Thal, 1991), corresponding, to harvest of 3 400 - 5 600 flowering stems per acre. But plastic sheet coverage is advantageous if safflower is cultivated as a fresh cut-flower (Essig & Loeser, 1988). Late-flowering spineless cultivars with dark orange to vermilion-red flowers are preferred for drying, and lower sowing rates given here copiously branched stems, but flower heads do not open uniformly. Leaf vigour at flowering time is not considered a prior quality argument for dried flowers, so herbicide treatment through lenacil or trifluralin can be used at irrigated outdoor areas. (Uher & Kobza, 1997).

Greenhouse production

The cultivation applied for production of fresh flowering stems concern many growers due to the sensitivity of safflower florets to rain water. This is why a greenhouse cultivation is recommended. This postulated a rational exploitation of the area for cultivation; a short-time precultivation in multicells followed by planting 64 plants per square meter, at corresponding distances with chrysanthemum nets (Hartrath, 1986). However, precultivation increases the liability of non-uniform plant development or even drop-out after planting as consequence of pertinent damage of sensitive root system. Exact monitoring of factors influencing flower induction in safflower, like a photoperiodical sensitivity or thermoinductivity, was not recorded still in ornamental varieties. A sowing dead-line in unheated greenhouses is at the 26th calendar week, in heated greenhouses at 30th (32th) week (Bongartz, 1995). In the Netherlands, as a cut-flower safflower is supplied by 60 horticultural companies day after day from (20th) 24th to 40th calendar week, especially from greenhouses economized through tulip forcing in winter season (Vegter, 2002). But through import from African countries (especially from Kenya and Zimbabwe) safflower is available for world market year round today (Kiptum, 1998). Exact flower heads maturity stage is critical for product quality, what does a mechanized harvest impossible: 20-30 per cent of central florets has to be opening in capitula, other will be developed at consumer. Stem length is established at a 0.7-0.8 m for the superior quality product. Cooling immediately after cut of stems is imperative for quality keeping. Safflowers as typically seasonal product seems to be one of the least flowers demanding for energy consumption (Vringer & Blok, 2000), but after Vegter (2002) producers costs ranged to 0.14 € per flowering stem, and certainly decreasing prices at Dutch flower auctions (table 2) may be one of factors leading to drop of safflower cut-flower production today.

Cultivars development

No florist's cultivar was mentioned until 1982. However, in the three following years twelve varieties were mentioned in European flower seed catalogues. At present nearly sixty cultivars have been especially developed for ornamental purposes (table 1), but more than forty of them were rejected. Actually European and Nipponese cultivars cover a request for safflower seeds in floriculture all the world over. In America, Bradley & al. (1999) evaluated a safflower germplasm for ornamental use, but offers of American seed corporations are still based on overseas trade. With respect to the high rate of handwork during the harvest of flowering stems, spineless cultivars were selected from old dye races: those derived from late and semi-late varieties (80-100 days to flowering) developed first in canopies used as dried flowers. But meanwhile there are not enough available spineless early varieties (60-70 days to flowering) of high quality standard, even nor cultivars recommended for the greenhouse production today are not without spines completely. Physiological drying of lower leaves during flowering and insufficient tolerance to diseases, among which *Colletotrichum* and *Fusarium* are most dangerous, represent other undesirable characteristics of ornamental varieties that necessitate further breeding work.



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Table. 1 – Safflower ornamental varieties offered by seed companies since 1985 (* rejected varieties)

cultivar	distributor companies	seed	earliness	spininess	fl. colour
Alba	Leen de Mos (Beekenkamp)		early	weak	white
Canarien Gelb *	Meisert, Chrestensen		late	medium	yellow
Cremewit *	Hamer, Zandbergen		early	weak	white
Donkeroranje Select *	Hamer (Florensis)		late	none	vermillion
Espo S&G 101	Zwaan Pannewis (Novartis)		early	weak	orange
Espo S&G 103 *	Zwaan Pannewis (Novartis)		late	none	orange
Espo S&G Spätstamm *	Zwaan Pannewis (Novartis)		late	none	orange
Feuerschopf	Benary, Austrostaat		late	none	orange
Goldköpfchen *	Meisert		early	weak	orange
Goldschopf *	Benary, Austrostaat		late	medium	orange
Ingrid *	Leen de Mos (Beekenkamp)		late	none	orange
Kinko	Sahin, JuliWa, GH Pacific		early	weak	orange
Lasting Orange	Sakata, Cerny, JuliWa		early	weak	orange
Lasting Tangerine	Sakata, Hamer, Sahin		medium	none	vermillion
Lasting White	Sakata, Cerny, JuliWa		early	weak	white
Lasting Yellow	Sakata, Cerny, JuliWa		early	weak	yellow
Limo	Genesis, GH Pacific		early	weak	yellow
Magnificum Oranje *	Hamer (Florensis)		early	weak	orange
Master Orange	Novartis		early	weak	orange
Master Yellow	Novartis		early	weak	yellow
Master White	Novartis		early	weak	white
Orangefeuer *	Walz (Florensis)		early	weak	orange
Oranjegeel*	Zandbergen		early	weak	orange
Orangeköpfchen *	Meisert		late	weak	orange
Orange Ball	Royal Sluis		early	weak	orange
Orange Everlasting	Genesis		late	none	orange
Orange Grenade	Kieft, Müller		early	weak	orange
Orange Pinsel	Wyss		early	weak	orange
Selektion Gelb *	Walz (Florensis)		early	weak	yellow
Selektion Weiss *	Walz (Florensis)		early	weak	white
Shiro	Sakata, Ball, Sahin		early	weak	white
Silberköpfchen *	Meisert		late	medium	white
Sophia *	Leen de Mos (Beekenkamp)		early	weak	orange
Splendid Orange *	Sakata		early	weak	orange
Summersun	Hamer (Florensis), Ball		early	weak	yellow
Toupet Jaune *	R. Blank		medium	medium	yellow
Toupet Orange *	R. Blank		late	none	orange
Treibgelb	Meisert		early	weak	yellow
Treibgold	Meisert, Benary, Austrostaat		early	weak	orange
Treiborange	Meisert		early	weak	orange
Treibweiss	Meisert		early	weak	white
Vierka	MZLU		medium	none	vermillion
Vogro *	Leen de Mos		medium	abundant	yellow



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	(Beekenkamp)			
Weisser Pinsel	Wyss	early	weak	white
White Ball	Royal Sluis	early	weak	orange
White Grenade	Kieft, Müller	early	weak	white
Yellow Grenade	Kieft, Müller	early	weak	yellow
Zanzibar	Genesis, Müller	early	weak	orange
Zitronenköpfchen *	Meisert	medium	medium	yellow

Table 2 - Safflower statistics at Holland flower auctions

	1990	1995	2000	2005	2006	2007
turnover total (x € 1000)	1 419	3 311	5 321	3 821	3 509	3 382
flower.stems: total sale	12,682,000	26,653,000	35,207, 000	24,964, 000	23,775,000	19,238, 000
price € / flower.stem	0.11	0.13	0.15	0.15	0.15	0.18
import sale (x € 1000)	not listed	not listed	2 582	2 098	1 314	905
flower.stems import sale	not listed	not listed	14,076,000	13,986 000	7,442,000	5,226,000
price € / import fl.stems	not listed	not listed	0.18	0.15	0.18	0.17

Table 3 - Comparison of commercial importance the top ten annuals among cut-flowers

product / fl. stem sale 1990	rank	sale 1995	rank	sale 2000	rank	sale 2007	rank	
Helianthus	2,900,000	78	32,184,000	23	64,892,000	18	65,758,000	19
Antirrhinum	19,798,000	32	32,840,000	35	24,316,000	48	35,221,000	32
Matthiola	28 610 000	24	30 910 000	30	20 818 000	43	31 351 000	33
Celosia	9 606 000	43	17 079 000	47	26 450 000	36	19 388 000	43
Carthamus	12 682 000	46	26 653 000	46	35 207 000	39	19 238 000	59
Amaranthus	25 753 000	45	34 364 000	56	27 176 000	62	17 881 000	72
Callistephus	11 639 000	59	21 234 000	63	13 256 000	90	15 301 000	81
Ammi	27 961 000	33	11 780 000	76	10 640 000	95	12 846 000	77
Lathyrus	16 877 000	42	3 859 000	104	10 949 000	84	9 121 000	89
Papaver	1 559 000	96	3 859 000	104	8 518 000	98	5 948 000	93

(Panicum and Setaria are not registered: VBN statistics are not available before 2000)