

The *Botrytis* Problem in Figures

Tjeerd A. Vrind
FloraHolland, Middelbroekweg 29, 2670 AE Naaldwijk
The Netherlands

Abstract

Botrytis infection results in considerable losses in the flower and pot plant industry. It results in vase life reduction in flowers such as roses, gerbera and lisianthus (*Eustoma*). In a series of vase life tests at the flower auction, in 2000-2003, we observed *Botrytis* infection in about 15% of all tests with roses, 25% of the tests with gerbera, and as much as 30% of the tests with lisianthus. Vase life of bunches of flowers with *Botrytis* infection was, on average, reduced by 3 days in rose and gerbera and by as much as 6 days (about half of the control value) in lisianthus.

An analysis was made of produce brought to the auction and found out by inspectors to have visible *Botrytis* infection. In roses as few as 23 cultivars (out of 225 cultivars sold at the auction) and 19 growers (out of 235) explained as much as 80% of *Botrytis* incidence. The cultivars represented a market share of 16% and the growers that brought roses with visible *Botrytis* a market share of 6%. Similarly, 80% of *Botrytis* incidence in gerbera was explained by 20 cultivars (22% of the market share) and 14 growers (33% of the market share). In lisianthus 80% of *Botrytis* infection at the auction was explained by 16 cultivars and 25 growers (both about 50% of the market share). It is concluded that *Botrytis* infection, insofar visible at the auction, is determined by a low percentage of cultivars (and growers) in roses and gerbera, but by about half of the cultivars (and growers) in lisianthus. In roses and gerbera the problem can apparently be solved, to a large degree, by elimination of a relatively small number of cultivars. In lisianthus in contrast, a large percentage of the cultivars grown in Holland show *Botrytis*.

INTRODUCTION

Botrytis infection results in losses in several floricultural crops like rose, gerbera and lisianthus. Visible infections in these crops are already observed in produce that is brought to the auction. Considerable losses are subsequently made during further distribution. Infection with *Botrytis* finally leads to dissatisfied consumers, which in marketing terms is even more important. I will here present figures that are both from the VBN (the Association of Dutch Flower auctions) and data from FloraHolland, the largest flower auction in the Netherlands

RESULTS

Economical Effects

It is not easy to calculate the economical damage caused by *Botrytis* infection in the floricultural chain, but to get an impression of this damage at flower auction level, a calculation is made for the three most important *Botrytis*-sensitive products (rose, gerbera and lisianthus), as shown in Table 1. The basis for this calculation is 1) the average difference in price at the auction between products with visible *Botrytis* infection (quality B) and products without it (quality A1), 2) the percentage of produce sold with visible *Botrytis* infection, and 3) the total number of stems sold at the Dutch flower auctions. The data refer to January through December 2002. The total damage at auction level is as much as 1.7 million euro. The real damage is likely to be much higher because:

- a) *Botrytis* infection that is not visible at the auction will show at later phases during distribution
- b) *Botrytis* infection that is visible is likely to become much worse during distribution. In both a) and b) the economical damage will be higher because of added value to the product.

- c) The consumers loss of confidence
- d) Big trading parties may replace the unreliable *Botrytis* sensitive products (rose, gerbera, lisianthus) by less sensitive products. For example, gerbera, a typical bouquet flower, can easily be replaced in bouquets by another flower species.

Results of Quality Inspection at Flower Auction FloraHolland (at Naaldwijk)

The incidence of visible *Botrytis* at the auction is, to a considerable degree, due to specific cultivars and growers. Growers who do not have the right conditions (such as climate) in the greenhouse or the right postharvest conditions, might have more *Botrytis* infection than others. To get an impression of these grower and cultivar effects, the data of rose, lisianthus and gerbera sold at the auction FloraHolland have been analysed. The data refer only to growers in the Netherlands, thus the import product is here excluded. The results are presented in Table 2.

Botrytis seems to be a bigger problem for gerbera and lisianthus than for rose. Only 53 of the 235 growers who supplied roses at the auction and 71 of the 225 traded rose cultivars received a remark for visible *Botrytis*. Only 23 cultivars and 19 growers explained 80% of the total *Botrytis* infection found during quality inspection.

Thus from this point of view the *Botrytis* problem in lisianthus and gerbera is of a different magnitude. The number of lisianthus and gerbera growers who traded produce that had visible *Botrytis* infection was much higher than in rose. Why would the *Botrytis* problem be less in rose? The temperature at which roses are stored at the grower and at the auction is lower (about 4 °C) than the temperature for lisianthus and gerbera storage (about 8 °C). It is often assumed that the lower of these temperatures are less optimal for *Botrytis* development. There may also be an effect of the moment of quality inspection at the auction (which in general occurs one to two days after harvest).

The results of vase life tests with roses, gerbera and lisianthus at FloraHolland (during 2000 to 2003) seem to confirm the suggestion that the *Botrytis* problem in rose is indeed less (Table 3). A separation is made in Table 3 for vase life tests in which *Botrytis* infection was observed (and where vase life was limited by this infection) and vase life tests in which none of the flowers showed any *Botrytis* infection. Although this method gives only a rough impression, in only 15 percent of the tests with rose flowers vase life was limited by *Botrytis* infection. In gerbera and lisianthus this figure was nearly double. In these tests the average vase life of gerbera and rose was reduced by about 4 days, when visibly infected by *Botrytis*, but the difference was as much as about 6 days in lisianthus.

Transport and Packaging Effects

Transport and packaging conditions can have a great impact on *Botrytis* infection. Flower auctions advise their suppliers to use hot needle perforated sleeves for roses to reduce the infection risk. In the refrigerated rooms of the auction the difference between the types of sleeves is very clear. Non-perforated sleeves often show condensation at the inner sleeve side, whereas the perforated sleeves do not show such condensation. This indicates that air humidity is lower and air exchange is higher in the perforated sleeves. These factors seem very important in *Botrytis* infection.

Gerbera (large flowers) and germinis (cultivars with smaller flowers) are transported either in closed cardboard boxes (dry) or in plastic containers with water on the bottom. In the latter system the stem ends are in the water, and the flowers are not wrapped in any type of sleeve. Table 4 shows the data of the gerbera and germini quality inspections of FloraHolland in 2001. It seems that the large gerbera flowers show more *Botrytis* than the germinis. It also seems that germinis transported in containers show more *Botrytis* than germinis packed in boxes. The reason for the latter difference is not known. RH levels and risk of condensation in both transport systems have not yet been determined.

In 2002 the VBN investigated the effect of storage temperature on *Botrytis* infection in gerbera, packed in boxes and germini, transported in containers. *Botrytis* infection was scored after a transport simulation of 6 days. In germini that were

transported in containers a low temperature (5 °C) resulted in less visible *Botrytis*, compared to the high temperature (20 °C). In the relatively large flower gerbera, packed in boxes, however, the low temperature produced more *Botrytis* in the petals but less infection in the middle of the composite flower (this infection is termed heart rot). The reasons for these effects are as yet unclear.

DISCUSSION

Botrytis infection causes considerable losses in the floristry chain. Growing conditions and cultivar choice are very important to reduce the problem, right at the start of the commercial process. If the right quality is produced, the packaging and transport conditions, which are diverse and more difficult to control, seem less important. Further research is required to solve a number of practical problems. For example a good detection method may show if a product is infected with germinated *Botrytis* spores or show early lesion development. A number of visible symptoms look like *Botrytis*, but they are not.

Tables

Table 1. Economical losses due to visible *Botrytis* infection, in rose, gerbera and lisianthus. The figures are based on the total number of flowers sold at the Dutch flower auctions in 2002, the percentage of flowers sold with visible *Botrytis* infection and the average decrease in the price per stem as a result of different quality classes (A1 vs B; see text). Numbers between parentheses in the first column refer to order of total sales (in euros at the auction). Rose is first in these terms and lisianthus comes at the twelfth place.

	number of stems traded	average % <i>Botrytis</i>	average price drop/stem (70%)	estimation of total loss
Rose (1)	3,305,000,000	0.27	€ 0.15	€ 1,311,755
Gerbera (5)	759,000,000	0.26	€ 0.11	€ 207,207
Lisianthus (12)	133,000,000	0.98	€ 0.20	€ 255,466
Total				€ 1,774,428

Table 2. Results of quality inspection of Dutch growers of rose, gerbera and lisianthus at FloraHolland (at Naaldwijk) in 2002.

	Rose	Gerbera	Lisianthus
Sold (x 1.000.000 stems)	448	204	62
Number of cultivars	225	385	142
Number of cultivars sold with <i>Botrytis</i> remark	71	69	61
Number of growers	235	61	107
Number of growers with <i>Botrytis</i> remark	53	43	70
80% of the visible <i>Botrytis</i> infection is explained by:			
Cultivar (number)	23	20	16
Cultivar (market share)	16%	22%	50%
Grower (number)	19	14	25
Grower (market share)	6%	33%	47%

Table 3. Results of FloraHolland vase-life tests (2000-2003).

	A	B	(B)
Gerbera	10,2	6,8	25%
Lisianthus	12,5	6,7	30%
Rosa	10,4	7,1	15%

A = average vase-life without *Botrytis* contamination

B = average vase-life with *Botrytis* contamination

(B) = % of total vase life-tests

Table 4. Results of quality inspection regarding *Botrytis* at the FloraHolland auction in 2001 for gerbera (relatively large flowers) en germini, transported in boxes (dry) and in containers with water.

	Boxes		Containers (no sleeves)	
	Stems (x 1.000.000)	<i>Botrytis</i> (%)	Stems (x 1.000.000)	<i>Botrytis</i> (%)
Germini	95	0,13	104	0,56
Gerbera	75	0,31	0,5	5,75
Gerbera total	170	0,23	104,5	0,58