Recent Developments in the Inspection Schemes of Flower Bulbs

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Keywords: BKD, quality, *Tulipa*, *Lilium*, tracking, tracing, control systems, audits

Abstract

In 1921 six *Narcissus* growers took the initiative to start an inspection service to perform field inspection on stem nematode (*Ditylenchus dipsaci*) in *Narcissus*. From the mid 40's of the 20th century the inspection programs on quarantine organisms for the different crops were extended with an inspection on quality aspects. This was on request of the growers of flower bulbs. The aim of these quality inspections was and is to improve the quality of the grown flower bulbs. The system of quality inspections, with its standards, exists for some crops for more than 50 years. In 1980 the system of voluntary quality inspections has been changed into an obligatory system. Due to the quality of the flower bulbs, depending on the crop 97 up to 99% of the lots meet the standards of the Flower bulb Inspection Service (BKD), and due to the recent change of the financing of the inspections, there is discussion about the obligatory quality inspections. The BKD states that the grower must take more responsibility in the quality of lots and growers want to have more influence on the inspections by the BKD. Also questions have been raised on the necessity of the intensive inspection programs, because yearly only 1-3% of the inspected lots, depending on the crop, is rejected by the BKD. In the coming years the BKD will develop a system with emphasis on controlling activities of the growers and less on the physical inspections of planted lots. On the other hand various important importing countries of flower bulbs demand additional regulation or specific demands, for instance China and the United States of America. This will lead to the development of special certification schemes for various crops with low tolerances for especially viruses and special programs to meet these low tolerances. Not only the health of a crop will be important, but also under what conditions it has been grown and how the tracking and tracing is safeguarded.

INTRODUCTION

The BKD exists 85 years and the field inspections of flower bulbs on quality aspects and quarantine aspects has been the base for the work of the BKD for all these years. Especially in the last decade the bulb industry has changed. Yearly 5% of the companies closes down. The remaining companies are getting bigger and are more and more professionally managed. These companies ask different service from the BKD than the standard inspections. The companies feel responsible for the quality of the flower bulbs. This means a different role for the BKD. To understand the coming changes, it is good to know the history of the inspections of the BKD.

MATERIALS AND METHODS

In 1921 six *Narcissus* growers from a small town in the Central Bulb District took the initiative to start an inspection service to perform field inspection on stem nematode (*Ditylenchus dipsaci*) in *Narcissus*. The one and only reason to start this inspection 85 years ago is still valid: to have a free access to export markets. In 1923 the first field inspections were done (Meertens, 1998; Knippels, 2005). This step was the start for the Flower bulb Inspection Service (BKD) as we know it nowadays.

The initiative in 1921 was the start of a voluntary field inspection in *Narcissus* on stem nematode. In the 30's of the 20th century there was an obligatory inspection on

quarantine pests in flower bulbs established, based on Dutch legislation. The initiative for *Narcissus* was followed by *Hyacinthus*. On request of the growers of these crops a field inspection on *Xanthomonas hyacinthi* was started in 1926. A couple of years later this inspection was extended with an inspection on *Ditylenchus dipsaci* (Meertens, 1998).

Voluntary Field Inspection on Quality

From the early 40's the inspection for the different crops was extended with an inspection on quality aspects on request of the growers of flower bulbs. This inspection on quality aspect was a voluntary program. The start was with *Tulipa*, soon followed by other crops.

The aim of these quality inspections was to improve the quality of the grown flower bulbs. The growers could voluntary participate in the inspection. If you participated, you had to follow all the rules and requirements. There was a classification system for the lots, with the classes A and B. Class A was the highest class, with the most strict standards for viruses, trueness to type, etc. There were no restrictions on the trade of propagation material. But as a buyer of propagation material you had the choice between 'good' and 'better' material. This system stayed until 1979.

To an Obligatory Inspection

In 1979 a discussion was started on the future of the voluntary quality inspections. The bulb industry was in favour of an inspection in which all growers participated. This was not possible in the legal situation then. Therefore, the Ministry of Agriculture decided that the voluntary system of the industry would be changed into an obligatory quality inspection based on national legislation. This legal base became the Agricultural Quality Act of 1980. From this year on the quality inspections are based on this Act.

The Obligatory Quality Inspection

The Agricultural Act and derived regulation regulates:

- Obligatory registration of all growers;
- Yearly registration of the planted lots;
- Yearly inspection of all planted lots by BKD;
- The BKD has quality standards for the various crops.

Until 1998 there was only a national base for the inspections. This changed in 1998. In the Marketing Directive for propagation material of ornamental 98/56/EG plants it has been described that flower bulbs have to be inspected at least once during the growing season and have to be found substantially free from pests and diseases.

The BKD has quality standards for viruses, fungi, bacterial diseases, insects, nematodes and trueness to type. During the years the BKD has developed quality inspection schemes for the various crops. Important parts of these schemes are classification of the lots and rejection of lots. The classification is a scale for quality of the lots and regulates the use of the bulbs of the lots. Only bulbs classified in the highest class can be traded to another grower to be used as planting material. Lots that do not meet the minimal standards are rejected and cannot be used for further growing or propagation.

RESULTS AND DISCUSSION

The obligatory quality inspections exist now for almost 30 years. In general you can say that the quality of the flower bulbs is on a high level. Depending from the crop 97 up to 99% of the lots meet the standards of the inspections. Besides these figures the results of the tests of the two most important crops, *Tulipa* and *Lilium*, give a good impression of the quality of these lots.

The average *Tulip Breaking Virus* (TBV) level in *Tulipa* lots detected by DAS-ELISA is 1.9%. This is the result of testing about 3,500 bulb samples. This yearly test is part of the inspection for those varieties in which TBV is difficult to see or can only be seen during a short period. This average for the so called DAS-ELISA varieties gives a

good indication on the TBV-level in all tulips. Although there is a trend of an increased TBV level in the DAS-ELISA varieties between 1998 and 2008, as presented in Table 1, it is still on a 'manageable' level' (Anonymous, 2009).

The success of the quality inspection is very clear for the DAS-ELISA tests of *Lilium* on *Lily Mottle Virus* (LMoV) and *Symptomless Lily Virus* (LSV), as presented in Table 2. This test is obligatory on those *Lilium* lots which are intended to be used for propagation. Only the best lots are used for further growing and propagation. This has resulted in very low average LSV and LMoV level based on DAS-ELISA tests. Between 1998 and 2007 the LMoV level has gone down from 0.5 to 0.3%, the average LSV-level has dropped down from 5.3 to 1.7% (Anonymous, 2008).

Depending on the crop 1 up to 3% of the lots are rejected during the field inspections (Anonymous, 2008). The most important reasons for rejection are viruses and nematodes. There can be several developments distinguished based on figures for the years 1993 and 2007, as presented in Table 3:

- The area of *Tulipa* which is rejected on TBV based on visual inspections shows a stable situation. In the years between 1993 and 2007 the rejected area increased and due to a more strict inspection scheme, research by Applied Plant Research (PPO Lisse) and efforts of the grower the rejected area has decreased;
- In 1993 the virus *Tulip Virus X* (TVX) was a relatively new virus. The virus was found on a low level in a very limited numbers of lots of a limited number of growers. Nowadays the virus is found throughout all growing areas in The Netherlands and in almost all groups of *Tulipa* varieties. Research by Applied Plant Research, in which the BKD participates, must give answers on how this virus is spread besides by the tulip mite and how the growers can control the vectors and the virus itself;
- *Tobacco Rattle Virus* (TRV) was in 1993 a small problem, as it still is nowadays, it is on a low level (Knippels et al., 1998). Not only in *Gladiolus*, but in almost all bulbous crops, in general on al low level. Especially in the last years of the 20th century the BKD rejected numerous lots of this virus. The rejected area decreased later, in spite of the fact that there are limited possibilities for treating the soil against nematodes;
- *Ditylenchus dipsaci* is a quarantine pest in the European Union. For flower bulbs there is a program of the BKD to control the spread of this organism. Based on the figures one can draw the conclusion that there is no situation of controlling the spread of the organisms. This also applies to *Aphelenchoides subtenuis* in *Crocus* and *Aphelenchoides fragariae/ritzemabossii* in *Lilium*. One can draw the conclusion that these nematodes are of more concern than the viruses for the BKD.

CONCLUSIONS

The quality of the flower bulbs is on a high level, only 1-3% of the lots are rejected based on a general standard of 1-2% diseased plants per lot. Furthermore, the Dutch flower bulb industry is going through a strong development: a decrease of the number of producers and the remaining producers are getting bigger and are more professionally managed: '20% of the producers produce 80% of the bulbs'.

These developments mean on one side that the need for the quality inspections changes. Growers have their own systems to keep the lots at a high quality level and take the responsibility for quality of the lots, instead of the situation that the BKD decides on the quality. This means for the BKD that it will change the systems and to give the growers more responsibility on the quality of the produced bulbs. In general this could mean that the growers can do the 'inspections' in the field, have control programs, but all under the supervision of the BKD.

From Inspection of Lots to Controlling Growers Quality System

In the next coming years the BKD will develop a program in which field inspections will be, partly, replaced by supervision on the work of the grower by the BKD. You could speak of an audit like approach. The BKD will describe the minimum requirements in general terms. It is up to the grower to have a system in place which

achieves the requirements of the BKD.

Model Supervising Growers Model

The BKD will not develop an (ISO) standard, but will do a risk analysis to determine the aspects, that have to be covered by the system the grower has implemented in his company. In more general terms one could think of these categories of aspects:

1. Identification of Lots and Tracking and Tracing. The grower has an administration in which the growing and all transaction of the bulbs are described clearly and transparent. This administration includes a map of the company, fields where the bulbs are grown and the storage facilities. This includes the identification of the lots during the growing season and storage.

2. Demonstrable Knowledge on Pests and Disease. The persons who are responsible for the quality of the bulbs must have checkable knowledge of the grown crops and of the pests and diseases that can occur in the crops. They must be trained and must be qualified to do this work. This must be described in a kind of handbook.

3. Protocol to Ensure that the Bulbs Meet the Legal Standards. The grower describes which activities are performed, by himself or by others, to show which activities are done to be sure the bulbs meet the BKD standards. Part of these descriptions are records in which it has been written down on which days which activities are done by whom, as well as the results.

4. Protocol to Ensure that the Grower Works According to Phytosanitary Conditions. The grower describes how he and his company deal with phytosanitary risks and which measures are taken to minimize these risks.

Tracking and Tracing

In the near future tracking and tracing will get more and more important in the work of the BKD. First of all due to the fact that new activities will be based on tracking and tracing, for instance in the model regarding supervising the growers system as described above.

In 2010 the new EU-directive on the control of potato cyst nematode 2007/33/EG will come into operation. In this directive only some flower bulbs are mentioned. There are several different ways to prove that the production fields are free from potato cyst nematode (PCN), but it also allowed to grow the flower bulbs mentioned in the directive on a field infected by PCN. The directive regulates the requirements for the trade within the European Union. Most countries outside the European Union have strict requirements regarding PCN on the import of flower bulbs from The Netherlands: the bulbs have to be grown on fields tested free from PCN. The requirements of these countries are more strict than the EU-directive. This means that producers and exporters must develop tracking and tracing systems to prove to the BKD that lots are not mixed or changed.

The third development is that more countries outside the European Union ask guarantees based on tracking and tracing approach; just export inspections only are not enough for them. The companies have to develop these systems according to the guidelines of the BKD and the BKD will supervise the implemented systems.

Development in the Market Access of Dutch Flower Bulbs

More countries outside the European Union request additional regulation, mostly on viruses. Recent examples are China and the USA. The emphasis is not only on the known and controlled viruses, but more and more on the ‘non-typical viruses’. With this we mean viruses which are not known to occur in The Netherlands or which are not known in flower bulbs. Various countries ask for monitoring or inspection programs for these viruses. These viruses could be serious threats for these countries (food or feed) crops. Besides attention for the viruses this implicates also attention to the vectors of the viruses.

Countries outside the European Union ask guarantees based on tracking and tracing, sometimes in combination with Good Horticultural Practice. These countries do

not want to rely on only the field inspections and export inspections.

ACKNOWLEDGEMENTS

The described developments implicate that the activities of the BKD will change in the next coming years: towards models for supervising growers systems, more emphasis on tracking and tracing and virus programs in combination with Good Horticultural Practice.

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Tables

Table 1. Average levels of *Tulip Breaking Virus* (%) in *Tulipa* (DAS-ELISA) between 1998 and 2008.

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Average percentage	1.2	1.2	1.4	1.5	1.6	2.1	2.1	1.7	1.5	1.4	1.9

Table 2. Average *Lily Mottle Virus* (LMoV) and *Symptomless Lily Virus* (LSV) levels (%) in *Lilium* (DAS-ELISA) between 1998 and 2007.

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
LMoV	0.5	0.4	0.3	0.2	0.4	0.4	0.4	0.3	0.3	0.3
LSV	5.3	4.8	3.6	3.0	0.8	2.3	0.3	0.9	0.8	1.7

Table 3. Overview of the most important pests and diseases, presented in the rejected area (are) and the percentage of the rejected area in comparison to area of inspected lots (%) for the years 1993 and 2007.

Crop	Disease	1993		2007	
		Rejected area (are)	% of total area	Rejected area (are)	% of total area
Tulipa	TBV	8,618	1.1	9,513	0.9
Tulipa	TVX	0	0.0	4,509	0.4
Gladiolus	TRV	273	0.2	413	0.4
Lilium	LMoV	2,598	0.9	130	0.0
Tulipa	*Ditylenchus dipsaci*	170	0.0	4,146	0.4
Crocus	*Aphelenchoides subtenuis*	1,787	3.4	902	1.7
Lilium	*Aphelenchoides fragariae/ritzemabossii*	1,166	0.4	4,459	1.1