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CULTIVATION AND PROTECTION OF SEASONAL FLOWERS IN GREENHOUSES IN STRUMICA

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Abstract

For the period 2014 – 2015, different varieties and hybrids of seasonal flowers were examined in greenhouses in Strumica. Nine flowering varieties were studied in the 2 year period: Verbena (*Verbena officinalis* L.); Salvia (*Salvia officinalis* L.); Aliciaum (*Alyssum martimum* Lam. Synonym *Lobularia maritima*); Petunia (*Petunia* sp.); Begonia (*Begonia* sp.); Tagetes (*Tagetes* sp.); Portulaca (*Portulaca grandiflora*); Impatiens (*Impatiens* sp.) and *Lobelia* sp. L. The technology and conditions of production were examined, including the conditions of seed production, seedling production, and planting and care during the whole vegetative stage, such as spraying, nutrient supplementation and preventive measures against diseases and pests. All examined variants were compared with untreated controls to assess for higher yield, quality and an earlier arrival time at market.

Five fungicides were used for preventative care: Ridomil Gold MZ 68 WG, Score 250 EC, Switch 62.5 WG, Bravo 500 SC and Topas 100 EC. In addition, 5 different insecticides were assessed: Actara 25 WG, Confidor SL 200, Karate Zeon 5 CS, Chess 50 WG and Pirimor 50 WG. Five variant solutions were studied, each consisting of 2 fungicides and 1 insecticide. All examined variants were highly effective. However, the best performance in 2014 was achieved with a variant containing Bravo 500 SC, Topas 100 EC and Chess 50 WG, and 1 containing Topas 100 EC, Switch 62.5 WG and Pirimor 50 WG. Both of which had a coefficient of efficiency of 99.6%. The index of disease in 2014 in the control variant was 48.2%. In 2015, the control index variation was 54.1%, and the highest biological efficiency was achieved with the variant containing Bravo 500 SC, Topas 100 EC and Chess 50 WG, with a coefficient of efficiency of 98.4%.

In addition to these experiments, our examination was supplemented by surveys. From the polls it was found that flower growing in greenhouses was at an early stage of development, requiring appropriate resources, commitment and time, and that it was still a family business. It also required the state to provide a strategy for the development of floriculture and to invest in it, such that it could contribute to the growth of the national economy.

Key words: *fungicides, insecticides, surveys*

INTRODUCTION

Throughout the world, floral species are studied in order to create new genotypes with higher values. Floriculture in the Republic of Macedonia also re presents a large part of the agricultural production, having a significant role in teconomic development. Лозановски и Јанкуловски (1994) estimated that it occupies 10% of the total cultivation area, about 65,000 ha.

A 2-year trial (2014 - 2015) was conducted in order to assess relevant indicators in hybrid flower production. In particular, characteristics during cultivation in greenhouses, including appropriate fungal and insect protection, were determined.

On the basis of these results recommended could be made for wider production. Hybrids that are selected for cultivation should be

characterized by quality, yield and tolerance of certain diseases (Evens & Hensley, 2004; Carvalho et al., 2005).

In addition to analysing the cultivation and disease and insect protection of flowers in greenhouses, we also assessed the cultivation of flowers as a family business, and its contribution to the development of the regionand Macedonia (Caves, 1982).

MATERIAL AND METHODS

Seed materials were hybrids of foreign origin. The 2 years of research took place in greenhouses of an individual producer in Vladevci, Strumica.

For both years of the study, 9 flowering species were examined:

1. Verbena (*Verbena officinalis* L.)
2. Salvia (*Salvia officinalis* L.)
3. Alyssum (*Alyssum martimum* Lam. Synonym *Lobularia maritima*)
4. Petunia (*Petunia* sp.)
5. Begonia (*Begonia* sp.)
6. *Tagetes* sp.
7. *Portulaca grandiflora*
8. Impatiens (*Impatiens* sp.)
9. *Lobelia* sp. L.

The harvested hybrids were placed in 4 repetitions of 10 plants each.

In order to ensure normal growth and development of the test hybrids, adequate production methods were implemented in the greenhouses. For plant protection, fungicides and insecticides were used as preventative care. During 2014 and 2015, 5 fungicides were examined, Ridomil Gold MZ 68 WG, Score 250 EC, Switch 62.5 WG, Bravo 500 SC and Topas 100 EC. In addition, 5 different insecticides were also assessed, Actara 25 WG, Confidor SL 200, Karate Zeon 5 CS, Chess 50 WG and Pirimor 50 WG. The examined variant mixtures, a combination of 2 fungicides and 1 insecticide, were used to treat plants; non-treated plants were used as controls.

The experiment included a total of 5 variant treatments and an untreated control. Each variant treatment was performed on 10 plants in 4 repetitions, for a total of 40 plants. The first treatment was carried out on seedlings 4 days prior to planting. Another 3 treatments were performed at intervals of 10 days. The efficacy of the preparations was evaluated 10 days after the last treatment and was calculated according to the formula of Abbott (1925). The level of infection was scored on a scale of 0 - 5, and the disease index was calculated according to the Townsen-Heuberger formula (1943).

The research was also supplemented by a survey, which used basic research methods of comparative analysis. Methods and techniques for data collection were also used, including a method for analyzing document content and a test method for applying a survey to respondents. The survey was completed by 65 respondents, 15 flower producers, 25 flower shop workers and 25 flower consumers. As an instrument for conducting the research, a questionnaire was used. The respondents answered the questions with an appropriate form in which there was a brief explanation on how the questionnaire should be filled out, as well as general questions for the respondent.

RESULTS AND DISCUSSION

In this study, the phenophases of growth and plant development were followed and the nutrient status and flowering of plants were assessed.

By phenological observation, the occurrence and duration of individual phenophases were determined. The recording of the appearance and duration of each phenophase from sowing seeds to flowering was done in order to show the seasonal cultivation of the studied flowering species in a protected area, greenhouses in the Strumica region. In addition, comparisons were made between treated plants and their controls for each species. This analysis determined how and to what extent the application of appropriate production techniques, including the protection of plants from fungi and insects, was a crucial factor in the cultivation of flower crops in obtaining higher and better quality yields.

Chronologically ordered phenological and quantified results are given in Tables 1 - 4. There were visible differences in the number of days from planting to 20% flowering, and also to 70% flowering. This was significant because when a product arrives at market earlier it can command a higher price.

Control plants that were not fed and treated with plant protection products showed much fewer flowers of poorer quality. In addition, many of them lagged behind in their growth and development, with some dying due to diseases and pests.

Table 1. Phenological observations during 2014

Flower culture	Variants	Sowing date	Date of sprouting	Date of planting	Date of flowering 20%
Verbena officinalis	control, Ø	20.11.2014	30.12.2014	15.01.2015	20.02.2015
	treated	20.11.2014	30.12.2014	15.01.2015	10.02.2015
Salvia splendens	control, Ø	20.11.2014	25.12.2014	25.01.2015	10.03.2015
	treated	20.11.2014	25.12.2014	25.01.2015	28.02.2015
Alyssum martimum	control, Ø	20.11.2014	25.12.2014	30.01.2015	15.02.2015
	treated	20.11.2014	25.12.2014	30.01.2015	05.02.2015
Petunia sp.	control, Ø	25.11.2014	30.12.2014	25.01.2015	10.03.2015
	treated	25.11.2014	30.12.2014	25.01.2015	25.02.2015
Begonia sp.	control,Ø	25.11.2014	10.01.2015	25.02.2015	10.04.2015
	treated	25.11.2014	10.01.2015	25.02.2015	25.03.2015
Tagetes sp. L.	control,	25.11.2014	20.12.2014	15.01.2015	02.03.2015
	treated	25.11.2014	20.12.2014	15.01.2015	20.02.2015
Portulaca grandiflora	control, Ø	25.11.2014	30.12.2014	25.01.2015	25.03.2015
	treated	25.11.2014	30.12.2014	25.01.2015	10.03.2015
Impatiens sp.	control, Ø	25.11.2014	30.12.2014	25.01.2015	15.03.2015
	treated	25.11.2014	30.12.2014	25.01.2015	01.03.2015
Lobelia sp. L.	control, Ø	25.11.2014	30.12.2014	15.02.2015	20.03.2015
	treated	25.11.2014	30.12.2014	15.02.2015	10.03.2015

Table 2. Phenological observations during 2014

Flower culture	Variants	Days from sowing to sprouting	Days from sprouting to planting	Days from planting to flowering
Verbena officinalis	control, Ø	40	16	36
	treated	40	16	26
Salvia splendens	control, Ø	35	31	44
	treated	35	31	34
Alyssum martimum	control, Ø	35	36	16
	treated	35	36	6
Petunia sp.	control, Ø	35	31	44
	treated	35	31	31
Begonia sp.	control, Ø	46	46	44
	treated	46	46	28
Tagetes sp. L.	control, Ø	25	26	36
	treated	25	26	26
Portulaca grandiflora	control, Ø	35	26	31
	treated	35	26	16
Impatiens sp.	control, Ø	35	26	49
	treated	35	26	35
Lobelia sp. L.	control, Ø	35	47	33
	treated	35	47	23

Table 3. Phenological observations during 2015

Flower culture	Variants	Sowing date	Date of sprouting	Date of planting	Date of flowering 20%
Verbena officinalis	control, Ø	20.11.2014	30.12.2014	15.01.2015	20.02.2016
	treated	20.11.2014	30.12.2014	15.01.2015	10.02. 2016
Salvia splendens	control, Ø	20.11.2014	25.12.2014	25.01.2015	10.03. 2016
	treated	20.11.2014	25.12.2014	25.01.2015	28.02. 2016
Alyssum martimum	control, Ø	20.11.2014	25.12.2014	30.01.2015	15.02. 2016
	treated	20.11.2014	25.12.2014	30.01.2015	05.02. 2016
Petunia sp.	control, Ø	25.11.2014	30.12.2014	25.01.2015	10.03. 2016
	treated	25.11.2014	30.12.2014	25.01.2015	25.02. 2016
Begonia sp.	control, Ø	25.11.2014	10.01.2015	25.02.2015	10.04. 2016
	treated	25.11.2014	10.01.2015	25.02.2015	25.03. 2016
Tagetes sp. L.	control, Ø	25.11.2014	20.12.2014	15.01.2015	02.03. 2016
	treated	25.11.2014	20.12.2014	15.01.2015	20.02. 2015
Portulaca grandiflora	control, Ø	25.11.2014	30.12.2014	25.01.2015	25.03. 2016
	treated	25.11.2014	30.12.2014	25.01.2015	10.03. 2016
Impatiens sp.	control, Ø	25.11.2014	30.12.2014	25.01.2015	15.03. 2016
	treated	25.11.2014	30.12.2014	25.01.2015	01.03. 2015
Lobelia sp. L.	control, Ø	25.11.2014	30.12.2014	15.02.2015	20.03. 2016
	treated	25.11.2014	30.12.2014	15.02.2015	10.03. 2016

Table 4. Phenological observations during 2015

Flower culture	Variants	Days from sowing to sprouting	Days from sprouting to planting	Days from planting to flowering
Verbena officinalis	control, Ø	40	16	36
	treated	40	16	26
Salvia splendens	control, Ø	35	31	44
	treated	35	31	34
Alyssum martimum	control, Ø	35	36	16
	treated	35	36	6
Petunia sp.	control, Ø	35	31	44
	treated	35	31	31
Begonia sp.	control, Ø	46	46	44
	treated	46	46	28
Tagetes sp. L.	control, Ø	25	26	36
	treated	25	26	26
Portulaca grandiflora	control, Ø	35	26	31
	treated	35	26	16
Impatiens sp.	control, Ø	35	26	49
	treated	35	26	35
Lobelia sp. L.	control, Ø	35	47	33
	treated	35	47	23

The results of the biological investigations of fungicides and insecticides for greenhouses production of flowers in Vladevci, Strumica are shown in Tables 5 and 6. All examined combinations of fungicides and insecticides showed high efficacy in protecting the flowering plants grown in greenhouses in 2014 and 2015. In 2014, the highest efficacy was achieved for the combination of Bravo 500 SC, Topas 100 EC and the Chess 50 WG, and for Topas 100 EC, Switch 62,5 WG and Pirimor 50 WG, with scores of 99.6%.

It is important to note that other combinations of fungicides and insecticides also

showed high efficacy in preventing damage by fungi and insects. The disease control index in the control plants reached an extremely high level of 48.2% of disease and leaf mass loss in 2014.

The results from 2015 indicated a high percentage of protection against diseases and pests for the species grown in the greenhouses. The efficacies of the examined combinations were 1 - 2% lower compared to 2014. However, it is important to note that the control plants had a higher level of infection at 54.1% in 2015 compared with those in 2014 (48.2% index of disease).

The 2 best treatments with efficacies of > 98% were the second variant of Score 250 EC, Switch 62.5 WG and Confidor SL 200 and the fourth variant of Bravo 500 SC, Topas 100 EC and Chess 50 WG (Table 6).

Table 5. Efficacy of fungicides and insecticides in flower crop species in 2014

Serial Number	Variants	Index of disease %	Efficacy %
1.	Ridomil Gold MZ 68 WG Topas 100 EC Actara 25 WG	2.2	98.4
2.	Score 250 EC Switch 62,5 WG Confidor SL 200	0.8	99.2
3.	Switch 62,5 WG Bravo 500 SC Karate Zeon 5 CS	0.6	99.4
4.	Bravo 500 SC Topas 100 EC Chess 50 WG	0.2	99.6
5.	Topas 100 EC Switch 62,5 WG Pirimor 50 WG	0.2	99.6
6.	Control (untreated)	48.2	/

Table 6. Efficacy of fungicides and insecticides in flower crop species in 2015

Serial Number	Variants	Index of disease %	Efficacy %
1.	Ridomil Gold MZ 68 WG Topas 100 EC Actara 25 WG	3.4	96.4
2.	Score 250 EC Switch 62,5 WG Confidor SL 200	2.2	98.1
3.	Switch 62,5 WG Bravo 500 SC Karate Zeon 5 CS	2.6	97.3
4.	Bravo 500 SC Topas 100 EC Chess 50 WG	2.2	98.4
5.	Topas 100 EC Switch 62,5 WG Pirimor 50 WG	2.8	97.8
6.	Control (untreated)	54.1	/

On the basis of the surveys and statistically analysed data contained in the questionnaire, it was found that in the Republic of Macedonia it is relatively difficult to create a greenhouse environment for the commercial production of flowers. The results obtained can be generalized with 99% reliability. Of consumers, 60% believed that conditions have not been developed for flower crop production, while 30% considered that a large part of the development of a flower trade had been achieved. Of these, 10% of consumers considered that conditions for the development of flower trade were difficult.

The research found that the development of flower growing in greenhouses in our area is in the initial phase, consisting mostly of family businesses and most of these were self-financed.

CONCLUDING REMARKS

Based on the results obtained from the 2 years of research on the cultivation and protection of seasonal flowers in greenhouses in Strumica, the following significant conclusions could be drawn.

In the species where appropriate production technniques was applied, with regular feeding of the plants and appropriate and timely application of plant protection products, the occurrence of flowering was earlier. In some floral species such management practices resulted in flowers > 10 days before control plants. Earlier placing of flowers at the market brings a higher selling price, which means greater profit for the producer.

The control variants examined were characterized by significantly higher yield and quality when grown under greenhouse conditions.

All examined variants of fungicides and insecticides in 2014 and 2015 yielded a high percentage of efficacy for plants compared to no treatment.

It was best to apply preventive protection of at least 3 - 4 treatments of the fungicide and insecticide mixes. The first must be mandatory in the seedling stage, at least 3 - 4 days before planting, with 3 treatments at intervals of 10 days during the vegetative stage.

The high efficacy of the tested preparations was confirmed when compared with the control variant, where no chemical protection was applied. Control plants showed indexes of disease of 48.2% in 2014 and 54.1% in 2015.

The results of the study indicate that flower plants can not be successfully grown in greenhouses without adequate preventive chemical protection.

From the survey it was established that the development of flower growing in greenhouses in our area is in the initial phase, with self-financed family businesses.

The state needs to develop a strategy for the development of floriculture and provide necessary investment. Such a strategy will contribute to the development of the national economy.

REFERENCES

Abbott, W.S. (1925). *A method of computing the effectiveness of an insecticide*. J. Econ. Entomol., 18, 265-267.

Carvalho, S.M.P., Abi-Tarabay, H., & Heuvelink, E. (2005). *Temperature affects Chrysanthemum flower characteristics differently during three phases of the cultivation period*. Journal of Horticultural Science and Biotechnology, 8(2), 209–216.

Caves, R. E. (1982). *Multinational Enterprises and Economic Analysis*. Cambridge: Cambridge University Press.

Evans, M.R., & Hensley, D.L. (2004). *Plant growth in plastic, peat, and processed poultry feather fiber growing containers*. HortScience, 39(5), 1012–1014.

Лозановски, Р. и Јанкуловски, Д. (1994). *Агроклиматска класификација на Република Македонија од аспект на градинарското производство*. Симпозиум со меѓународно учество „Нови технологии во градинарството и цвеќарството"- Охрид, Зборник на трудови. - Кн. I. - Скопје: Земјоделски факултет, 25–31, 1994.

Townsend, G.R. & Heuberger, J.W. (1943). *Methods for estimating losses caused by diseases in fungicide experiments*. The Plant Disease Reporter, 27, 340-343.

ОДГЛЕДУВАЊЕ И ЗАШТИТА НА СЕЗОНСКО ЦВЕЌЕ ВО ОРАНЖЕРИИ ВО СТРУМИЦА

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Резиме

Во периодот 2014 и 2015 година се испитуваат различни сорти и хибриди сезонско цвеќе во оранжерии во Струмица.

Во двегодишниот период на испитување имаше 9 цветни сорти: вербена (*Verbena officinalis* L.); салвиа (*Salvia officinalis* L.); алиција (*Alyssum martimum* Lam. синоним *Lobularia maritima*); петунија (*Petunia* sp.); бегонија (*Begonia* sp.); Tagetes (*Tagetes* sp.); портулака (*Portulaca grandiflora*); импатиенс (*Impatien* ssp.) и *Lobelias* sp. L. Техниката и технологијата на производството биле испитувани во услови на производство, потоа биле испитувани условите за производство на семе, производство на садници, садење и нега во текот на целата вегетација (прскање, негување и превентивна заштита од болести и штетници.

Имено, сите испитани варијанти во споредба со контролната варијанта (нетретирани) се карактеризираат со повисок принос, квалитет и порано пристигнување за пласирање на пазарот.

За превенција се користени пет фунгициди: Ridomil Gold MZ 68 WG, Score 250 EC, Switch 62.5 WG, Bravo 500 SC и Topas 100 EC и пет различни инсектициди: Actara 25 WG, Confidor SL 200, Karate Zeon 5 CS, Chess 50 WG и Pirimor 50 WG. Од сите тестирани фунгициди и инсектициди за испитување, подготвени (се користат) се пет варијанти кои се состојат од два фунгициди и еден инсектицид. Сите испитувани варијанти даваат висок процент на ефикасност. Најефикасна, во 2014 г. се покажала варијантата Bravo 500 SC, Topas 100 EC и Chess 50 WG и Topas 100 EC, Switch 62.5 WG и Pirimor 50 WG, со коефициент на ефикасност од 99.6%.

Индексот на болеста во 2014 во контролната варијанта е 48.2%.

Во 2015 г. индексот на болеста во контролната варијанта беше 54.1%, а најголема биолошка ефикасност е постигната со варијантата Bravo 500 SC, Topas 100 EC и Chess 50 WG, со коефициент на ефикасност од 98.4%. Во прилог на нашите експерименти, нашето испитување беше дополнето со анкети.

Од анкетите беше откриено дека развојот на цвеќареството во оранжерии во нашите простори е во почетна фаза и бара соодветни ресурси, посветеност и време, и дека сè уште е во семеен бизнис. Исто така, тоа бара од државата да развие стратегија за развој на цвеќарството и да инвестира финансиски средства, што исто така ќе придонесе за развојот на националната економија.

Клучни зборови: *цвеќиња, фингициди, инсектициди, анкети, заштита*