Original Article

Growing seedlings of tomato varieties in protected ground

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Abstract

When growing tomatoes, a seedling method is used. Seedlings are grown in special cassettes, then placed in a permanent place. This is done for a more rational use of the greenhouse area. The nursery must be absolutely clean, disinfected and have good lighting. It is necessary to have the possibility of separate temperature control and ventilation. The most convenient method is to separate a part of the greenhouse with a transparent film. To maintain a constant microclimate, a double film is used. The growing time for seedlings is 9 weeks in winter, 6 weeks in spring and 5 weeks in summer. It is very important to grow healthy, strong, well-developed seedlings to a stage close to the flowering of the first brush.

Keywords: Tomato varieties, seeds, seedling cultivation, growth regulators, protected ground, Balarga, Campbell 33, Floradade и Rio Grande.

INTRODUCTION

The relevance of the work.

Good seeds are the key to a good harvest. However, outwardly healthy and beautiful seeds after sowing may not give the expected results. There can be several reasons for poor germination of tomato seeds and seedling diseases:

- too old seeds;
- tomato seeds are infected with various bacteria, viruses or pathogenic fungi;
- improper preparation of seeds for sowing;
- lack of favorable conditions for seed germination.

The foundation for a future good harvest of tomatoes is laid at the first stage of their cultivation - at the stage of preparing seeds for planting seedlings. Experienced summer residents begin pre-sowing preparation of seeds as early as February-March, carrying out special manipulations with them in order to speed up the emergence of seedlings, reduce the incidence of plants and, ultimately, increase their yield. Such preparatory activities include: culling, heating, disinfection, nutrient treatment, soaking, treatment with bio stimulants, pre-germination, hardening and bubbling of seeds. It is enough to carry out one or two procedures to get a significant increase in yield.

The aim of the study is a comprehensive study of tomato varieties and hybrids of the determinant type, determining the optimal sowing time for seedlings and seedling age, developing a technology for growing and seed production of tomato varieties Balarga, Campbell 33, Floradade and Rio Grande.

To achieve this goal, the following tasks were set:

- To select varieties and hybrids of tomato with a different shape of a bush for growing in film unheated greenhouses, to give an agrobiological assessment;

- To study the effect of sowing time and seedling age on the growth, development and productivity of tomato plants;

- To determine the influence of planting patterns and methods of formation of tomato varieties Balarga, Campbell 33, Floradade and Rio Grande on yield and seed productivity.

The object of the study was the seeds of tomato varieties Balarga, Campbell 33, Floradade and Rio Grande.

The subject of the study were growth bio stimulants Nutri Power and Root Winner.

Research methods:

1. An experiment using Nutri Power and Root Winner bio stimulants;

2. Comparison of the effect of selected bio stimulants on the growth and development of seeds of tomato varieties Balarga, Campbell 33, Floradade and Rio Grande.

The scientific novelty of the study lies in the fact that for the first time it uses bio growth stimulants Nutri Power and Root Winner to prepare seeds for planting seedlings. Bio stimulants are characterized as follows:

1. Improve seed germination and root growth.

The auxin contained in fertilizers improves seed germination, root growth, thereby providing an increase in the germination rate and survival rate during transplantation.

2. Yield increase.

This fertilizer provides a better development of the root systems of root crops and allows you to increase the yield.

3. Saturation of crops with nutrients.

Fertilizers of this series contain various trace elements and help to avoid nutritional deficiencies.

4. Increasing resistance.

Fertilizer increases the resistance of crops to negative environmental factors.

Sowing of seeds is carried out in cassettes or boxes. To do this, use a special sowing substrate for seedlings, which includes the necessary trace elements, as well as vermiculite. The presence of vermiculite in the substrate will prevent soil compaction after numerous irrigations. At the same time, its hygroscopicity will smooth out differences in moisture levels between irrigations. The moisture content of the peat mixture when filling the cassettes should be 50-60%. Sowing is carried out at a depth of 0.5-1cm. Seeds from Dutch producers treated with thiram fungicide do not need to be soaked or pre-germinated. After sowing, the cassettes or boxes are watered with warm water at 20-25 °C and placed in the germination chambers for 3-4 days, followed by control of the germination process. The temperature is maintained at the level of 22-24 °C, and the relative humidity of the air is approximately 80-85%.

In the first week, the growth and development of seedlings are strongly dependent on temperature; if it is high, especially in low light, then the seedlings are stretched and will be weak.

The following weeks the substrate humidity should be 75-80%, relative air humidity 60-65%. Maintain soil moisture by irrigation the seed boxes as needed. For irrigation, use a very fine spray jet and avoid getting large drops on the seedlings. If excessive drying of the soil is allowed, then the seed film will remain on the seedlings. The water temperature for irrigation is not less than 16-17 °C, the optimum is 18-20 °C.

Figure 1. 1 – Balarga, 2 - Campbell 33, 3 – Floradade, 4 - Rio Grande.

When shoots appear, the electric lighting system is turned on.

The irradiation power is: before picking - 400 W / m2, the duration of the first 2-3 days - 24 hours / day, then - 16 hours / day; after picking - 240 W / m2, 16 hours / day. Such a decrease in electric illumination is necessary in order to prepare seedlings for planting in a permanent place in an “adult” greenhouse, where electric lighting is not used. When the seedlings grow up, picking is necessary. At this stage of development, two cotyledons are erect, and the first true leaf is about 5 mm long. Avoid transplanting seedlings in the early morning as the plants will be hard and brittle at that time, resulting in damage when transplanted. The temperature of the substrate should be at this time 18-20 °C.

If the seeds were sown in boxes, transplant by lifting a part of the soil with the plant from below by hand, loosening the soil, and carefully moving it into a soil cube. Avoid pulling the plant out of the soil.

When picking, the root is shortened by a third, which stimulates the formation of a fibrous root system.

18-20 days after picking, seedlings are arranged in order to achieve optimal lighting. Seedling leaves should never overlap. And the thing is that light, depending on the color of a particular spectral part, affects plants differently. The rays of the violet and blue part of the radiation spectrum inhibit the growth of stems, leaf petioles and blades, form compact plants and thicker leaves, allowing better absorption and use of light in general. Accordingly, in the case of a high density of seedling placement, the dominance of apical growth will be observed during placement. Seedlings can stretch and weaken. These rays stimulate the formation of proteins, the organ synthesis of plants, the transition to flowering of short-day plants, and slow down the development of long-day plants. The blue-violet part of the light spectrum is almost completely absorbed by chlorophyll, which creates conditions for the maximum intensity of photosynthesis. So a breakdown is needed. Place 20-28 plants per 1 m2. Depending on the illumination and development, seedlings should be moved several times from place to new place, changing the plant density. The final density of plants should be no more than 16 plants per 1 m2 (depending on the season and the height of plants).

To obtain strong plants, one to two weeks before planting seedlings, it is recommended to lower the temperature. Maintaining the temperature at 23 °C. Within 9 days leads to the formation of 9 leaves under the first brush. When less than 9 leaves are

formed under the first raceme, the plant reaches too high a level of generative development for this stage (that is, by the time of planting in the soil), which leads to a decrease in yield.

If the plant develops too thick stems, it is recommended to slightly lower the night temperature. An increase in the difference between night and day temperatures contributes to the lengthening of the internodes and the stretching of the plant in height. A high average daily temperature will also promote plant elongation.

- An increase in the difference between day and night temperatures - The plant is stretched in height. Internodes are longer.

- Reduced difference between day and night temperatures - The plant is compact. Internodes are shorter.

- High average daily temperature - The plant is stretched in height. Internodes are longer.

- Low average daily temperature - The plant is compact. Internodes are shorter.

The ideal position of the first flower brush is its location between the 9th and 10th sheet. Two factors influence the height of the first flower brush: temperature and light. The more light, the lower the first brush is. The lower temperature during the first two weeks of seedling growth also results in a lower position of the first brush on the plant.

Landing.

A good seedling before planting should look like this: there should be 9-10 leaves under the first flower brush; internodes must be correctly spaced (average length 5-7 cm, depending on the hybrid); the stem of the plant should not be too thick or too thin.

There are several ways to place tomato plants in greenhouses. The most common for indeterminate hybrids is two-line (90-100) + (60-70) X (50-55) cm, that is, the distance between rows of plants is 60-70 cm, between tracks is 90-100 cm. The standing density for early-ripening hybrids is 2.4 plants/m2, for the main plantings - 2.5 plants/m2, seedlings are planted in a checkerboard pattern. Semi-determinate hybrids are placed with a large thickening - 2.6-3 plants / m2 (when grown in 1 stem).

Technological operations for the care of plants.

After planting, irrigation is carried out (2-3 l / m2). The temperature regime is adjusted depending on the level of illumination. On cloudy days in the greenhouse, it is necessary to maintain the air temperature at 20 ° C during the day and 17 ° C at night, on sunny days - 22 ° C and 18 ° C, respectively. After 2-3 days, the plants are tied to a vertically stretched twine and this operation is repeated once a week.

Plant formation.

Immediately after tying, plants begin to form. Form indeterminate varieties in one stem. In this case, a more balanced plant with high quality fruits is obtained. To do this, stepchildren are carried out 2 times a week - the removal of stepchildren when they reach 2-5 cm in length (no more than 5-7 cm) in length. Stepsons are usually carried out in the morning, stepchildren are removed to the ground.

Usually, semi-determinant tomatoes are formed either in two stems, or by the method of periodic reversal, deviating the axis of the plant every 2-3 inflorescences, and the most powerful one, the sub carpal stepson, is used as a continuation shoot. The top of the old shoot is pinched after the formation of 1-2 brushes on it. 1-2 leaves are left above the last inflorescence. This method allows you to form 14-16 brushes on the plant.

The goal of plant formation is to regulate vegetative growth depending on the phase of development and to obtain the maximum possible number of fruits.

To lay a good foundation for balanced production, you first need to get a strong plant. In general, we can say that a tomato plant has 15 leaves and 7-8 brushes with fruits per plant. The formation of one new brush per week is considered a normal frequency. A properly developed tomato plant should have three leaves between racemes (1-3 leaves for semi-determinant hybrids). The

plant is heavily loaded when the 8-11th brush blooms on it. At this stage, an increase in the generative development of plants should be avoided.

Signs indicating excessive generative development:

With enhanced generative development of the plant, the following features can be observed:

1. Relatively large number of fruits per plant.

2. High fruit weight, given the characteristics of this variety.

3. The top of the plant is too thin and small. The position of the upper flower cluster is very high: the top of the plant is located less than 15 cm above the upper flower cluster.

4. Fruit set is easy.

If the plant develops unbalanced, corrective measures should be taken. Always make minor adjustments and incremental changes. The reaction of the plant will be noticeable in a few days.

Removal of lateral shoots (stepping).

Side shoots should be removed, and the tops of the plants should be wrapped around the guide threads once a week. Do not turn the tip around the thread when it is still relatively small. Be sure to rotate the top exactly clockwise to avoid "squeezing" the plants when the tops of the plants turn towards the sun.

Removing leaves.

In the early stages of cultivation, old and damaged leaves at the bottom of the plant should be removed to improve air circulation and reduce the risk of plant infection with gray mold. The normal frequency of leaf removal is considered to be plucking 2-3 leaves per week.

You can follow the following principle: when harvesting from the first brush, the leaves must be removed before the second brush. With this approach, the brushes will be clearly visible and will not be obscured. In general, a plant should always have a minimum of 15 leaves to ensure good nutrient assimilation and growth.

Pruning flowers in the brushes (thinning).

Usually pruning of flowers is necessary to maintain the balance of plant development. The remaining fruits will be larger and more uniform, extra quality. In most cases, the following rule applies: In the first and second racemes, after pruning, 4-5 fruits (flowers) should be left, and in the remaining racemes, 5-6 fruits should be left.

The plant spends considerable energy on the development of flowers, therefore, the removal of excess flowers should be done when the flower brush is still small and the fruits have not reached full development. This is a highly precise procedure and must be carried out by dedicated people.

The first flower in the cluster may develop into a large fruit. Such flowers should be removed. When the "royal fruits" still appear, the plant shows enhanced vegetative development. This disturbance can also be the result of a sharp drop in temperature during the seedling growing stage. Always remove poorly pollinated flowers.

Air humidity control.

To control the temperature and humidity of the air, it is recommended to act on one or both of the following tips: do not forget to open the windows of the greenhouse for ventilation during the day and, if necessary, at night. When ventilating, always open

windows on the side opposite to the direction of the wind, as the resulting "chimney effect" will ensure good ventilation of the greenhouses.

The temperature and humidity of the air and soil are the most important indicators. They need constant monitoring, since any deviation from critical indicators leads to the development of diseases (root rot, fungal diseases, and so on) and violations of plant physiology (cracking of fruits and stems, top rot, and so on).

Irrigation.

Regular irrigation of plants begins immediately after planting. To maintain the water regime of the plant, it is necessary to water frequently and in small doses. For even distribution of water, it is best to use the drip irrigation method. Irrigation is carried out taking into account evaporation, solar radiation, soil structure, crop capacity, ventilation. The vegetable grower himself must make the right decision regarding the timing, rate of irrigation and fertilizer. For irrigation, always use water with a temperature above 15-16 °C.

When plants are irrigated, the level of nutrients in the soil, especially nitrogen, will quickly decrease, so it is recommended to combine irrigation with fertigation, taking into account the results of soil analysis.

The coefficient of water consumption in the winter-spring tomato culture is 45-50 l/kg of fruit.

The soil should be constantly moist, but not wet. With constant excessive irrigation, the soil turns sour, and a lack of oxygen leads to the death of the roots. With insufficient irrigation, the flowers can crumble, the fruits become smaller. With irregular irrigation, cracking of fruits is often observed, especially in the ripening phase.

Soil moisture, in different periods, is as follows:

- planting seedlings - the beginning of fruit formation 65-75% HB;

- the beginning of fruit formation - the first fees - 70-80% HB;

- the first collection - the end of the growing season - 80-85% HB.

Irrigation water quality requirements:

- absence of acids and various harmful impurities;

- the total salt content is not more than 1000-1200 mg/l;

- environment reaction close to neutral (pH=6…8);

- saturation with oxygen.

It is recommended to water in small doses during the critical period of daily water consumption, which occurs at noon.

Tomato nutrition.

The tomato plant is quite demanding on the conditions of mineral nutrition. At the initial stages of development, the consumption of elements is small. Usually, at this time, those fertilizers that are applied in the fall for tillage are enough. The tomato root system is characterized by a very weak absorption of phosphorus in the initial period, especially at low soil temperatures. The use of nitrogen in excessive amounts during this period leads to a strong foliage of plants and a shift in the balance towards the vegetative side. At the same time, the main peak of consumption falls on the period of intensive fruiting, when the action of the main fertilizers has ended. During this period, it is necessary to apply complex water-soluble fertilizers. Below is the ratio of substances in top dressing.

The selection of the concentration of nutrients must be carried out very carefully, since the tomato reacts sharply to the lack of any element. The occurrence of the symptoms described below is indicative of nutrient deficiencies, however, to determine the plant's nutrient requirements, it is necessary to analyze the nutrient content in the soil and in the leaves of the plant.

Nitrogen - Oldest leaves become chlorotic and eventually senesce prematurely, while young leaves turn yellowish green. Plants may be stunted.

Phosphorus - The leaves turn a dull green color and grow slowly. The underside of the leaves becomes reddish-purple over time. Older leaves are affected first and may senesce prematurely if severely infested.

Potassium - On the leaves, the symptoms of the disease appear as a burn of the edges of the leaves. On older leaves, chlorosis of the interveinal tissues may occur, while the veins themselves remain green. Symptoms begin on older leaves, and as the disease progresses, spread to younger leaves. Potassium deficiency can lead to disorders such as edema of the fruit, internal browning of the fruit, and diseases manifested in the disruption of the fruit ripening process.

Calcium - On leaves located at the top of the shoot, chlorosis of the interveinal tissues and necrosis of the edges of the leaves occur. The growth point (tip of the shoot) dies off over time. Blossom rot can form on fruits.

Magnesium - Chlorosis of the interveinal tissues forms on the leaves, which first appears on older leaves, and then spreads to younger ones. The midvein of the leaf remains green, while the interveinal tissues become necrotic.

Sulfur - Older leaves turn a light green color, and the stems and leaf petioles may become purple and spindle-shaped.

Boron - Older leaves turn yellow and become brittle, and the growing point necrotizes and dies. Fruits can also be affected and cork-like areas scattered over the surface appear on them.

Copper - Younger leaves wilt at first, then they may turn bluish green and curl upwards. Severely affected plants are stunted and have a chlorotic appearance.

Iron - on younger leaves, chlorosis of the interveinal tissues occurs, followed by a general yellowing of the leaves. The midrib of the leaf usually remains green.

Manganese - On younger leaves, chlorosis of the interveinal tissues occurs, followed by necrosis of the leaf tissues. At the same time, the middle vein of the leaf remains green.

Research results:

In these options, the longest primary roots and buds are formed (root length - 3.9 cm in control, 4.1 - 5.2 cm in experimental options; bud length - 5.2 and 6.2 - 6.4 cm, respectively). Seed treatment with test preparations enhances the process of accumulation of biomass and dry matter mass by seedlings (biomass - 2.001 g / 100 pcs in control, 2.134 - 2.485 g / 100 pcs, in experimental variants dry weight - 0.106 and 0.115-0.135) g / 100 pcs of seedlings). Based on the totality of the considered indicators, the optimal concentration of growth regulators tested for pre-sowing treatment of tomato seeds was established to increase the intensity of their germination, which made it possible to activate the growth processes of plants.

Conclusion.

1. The use of test preparations in the technology of growing tomatoes, in particular Nutri Power, Root Winner, significantly increases the biological resource and productivity potential of this crop.

2. Treatment of tomato seeds with tested growth regulators improved the quality of seed sowing (germination energy in control - 57.8%, in experimental variants - 60.0 - 70.0%; germination - 67.8 and 70.0 - 77.8%) and increased their intensity

(root length in control - 3.9 cm, in experimental variants - 4.1 - 5.2 cm, seedling length - 5.2 and 6.2 - 6.4 cm, seedling biomass - 2.001 and 2.134 - 2.485 g / 100 pieces, dry weight - 0.16 cm. 0.115 - 0.135 g / 100 pieces, respectively).

3. Proven growth regulators activate the photosynthetic activity of tomato plants. When seeds and plants were treated with them, the net productivity of photosynthesis significantly increased (in the period from the appearance of buds to the beginning of flowering - 2.7 - 3.0 g / m, in the control - 2.5 g / m; in the period from the beginning of flowering to the beginning of fruit formation - 4.4 - 4.9 g / m, control l - 4.2 g / m day), leaf yield (at the beginning of flowering - 0.56 - 0.62 g / dm, at the beginning of fruiting - 0.66 - 0.75 g/dm, at the beginning of cooking - 0.79 - 0.85 g/dm, in control - 0.54, 0.64 and 0.76 g/dm, respectively).

4. Under the influence of the tested growth regulators, the synthesis of pigments in tomato leaves increases, which indicates that the leaves retain high photosynthetic activity.

Double application of the test preparations (in seeds and plants) increases the accumulation of sugars and ascorbic acid in tomato leaves (sugar content in the budding phase - 3.63-3.98%, in control - dry weight of leaves - 3.49%; vitamin C - 51 , 4 - 54.5 mg, in the control - 48.3 mg / 100 g of raw materials) and their isolation into formed fruits (sugar content at the beginning of ripening - 1.93 - 2.08 and 1.81%, dry weight of leaves, vitamins C) - 41.8 - 43.9 and 38.4 mg / 100 g of raw materials, respectively).

REFERENCES

1. Autko A.A. etc. Protected ground vegetable growing. Minsk: publishing house "VE-VER". 2006. - 320 p.
2. Ageev, V. V. Root nutrition of agricultural plants: textbooks and studies. allowances for universities. - Stavropol: Stavropol State Agricultural Academy, 1996.- 134 p.
3. Ageev, V. V. Fundamentals of programming crop yields / V. V. Ageev, A. N. Esaulko, O. Yu. Lobankova and others // Edited by V. V. Ageev. - Stavropol: "AGRUS", 2011. - 200 p.
4. Andreeva, E. N. Influence of temperature on seed germination of different varieties of tomato / E. N. Andreeva // Reports of TSHA. - 1973. - Issue. 195. 127-130 p.
5. Autko, A. A. Protected ground vegetable growing / A. A. Autko, G. I. Ganush, N. N. Dolbik. - Minsk: VEVER, 2006. - 320 p.
6. Bryzgalov, V. A. Protected ground vegetable growing / V. A. Bryzgalov. -L., 1983.- 352 p.
7. Vasiliaukas, V. Mineral substrate for growing plants: Analytical review / V. Vasiliaukas, V. Pivoriunaite. - Vilnius, 1987.-44 p.
8. Vendilo, G. G. Fertilizer of vegetable crops / G. G. Vendilo, V. N. Petrichenko. - M. : Kolos, 1986. - 206 p.
9. Vlasov, A. S. Tomatoes all year round / A. S. Vlasov. - M. : Agropromizdat, 1991. - 80 p.
10. Sorokina V.V. Peculiarities of tomato cultivation in open and protected ground, its seed production. Gorki: BGSA, 2001. 28 p.
11. Handbook of pesticides and agrochemicals permitted for use on the territory of the Russian Federation, M. 2005. 723 p.
12. Shapoval O.A., Vakulenko V.V., Mozharova I.P. Technology for the integrated use of growth regulators and fungicides in the cultivation of agricultural crops (sunflower, sugar beet, winter wheat). M.: VNIIA, 2005. 48 p.
13. Sheudzhen A.Kh., Onshtsenko JI.M., Prokopenko V.V. Fertilizers, soils and growth regulators. Maykop: GURIPP "Adygea", 2005.-404 p.
14. Kostin, V.I. Optimization of production processes of cucumbers and tomatoes in protected ground conditions under the influence of extrasol and growth phytoregulators / V.I. Kostin, N.I. Epifanov, P.V. Smirnov // Sat. materials of the International scientific-practical conference "Agroecological problems of agricultural production"; Penza, 2005 – Penza: RIO PGSKhA. - 2005. - p. 121-124.
15. Kostin, V.I. Influence of presowing seed treatment of phytoregulators on growth and development / V.I. Kostin, P.V. Smirnov // Sat. materials of the All-Russian scientific and practical conference "Energy-saving technologies in crop production"; Penza, 2005 - Penza: RIO PGSHA. - 2005. - S. 73-75.
16. Smirnov, P.V. Influence of growth regulators and microelements on the quality of tomatoes when grown in greenhouse conditions / P.V. Smirnov // Proceedings of the international. scientific-practical conference "Modern problems of production technology, storage and processing and examination of the quality of agricultural products"; Michurinsk, 2007 - Michurinsk: publishing house of FGOU VPO MichGAU. - 2007. - V.1 - p. 250-253.
17. Smirnov, P.V. Influence of growth regulators on the sowing qualities of seeds and growth processes of tomatoes and cucumbers in greenhouse conditions / P.V. Smirnov, N.I. Epifanov//Materials of the Intern. scientific and practical conference dedicated to the 65th anniversary of the formation of the Volgograd State Agricultural Academy "The use of innovative technologies to solve the problems of the agro-industrial complex in modern conditions"; Volgograd, 2009 - Volgograd: IPK "Niva". - 2009. - p. 18-20.