Technology for hot peppers production in the conditions of unheated greenhouses of Uzbekistan

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Abstract: *Pepper – is a cultural plant of tropical Central and South America. It is originated in Mexico and Guatemala and there exist its various types. Sweet pepper was started to be grown 700 years before the BC while hot pepper was grown 2000 years before the BC. China, Mexico and Turkey are main producers of 70% pepper in the world. During 1998-2007 in European countries the share of hot pepper in the world import made 43,8%, for example, in Germany - 18,9%, England - 7,2%, France - 6,9%, Holland - 4,8%, Italy - 3,6%, and in Czechia - 2,4%. Hot pepper requires soil moisture, and during its growth moisture should not be lower than 75-80% comparing to field moisture capacity. But comparing to tomato the hot pepper is less demanding for relative air humidity, and this plant grows and develops well under 55-60 % moisture. In comparison with technical maturation of hot pepper at biological maturation its fruits contain 1,9 times more dry matters; quantity of sugar is 2,74 times more; acids are 2,3 and quantity of vitamins C is 3,64 times more.*

Key Words: *hot pepper, planting scheme, planting time, variety samples, seed, sprout, seedling, irrigation, fertilization, productivity.*

1. INTRODUCTION:

Pepper – is a cultural plant of tropical Central and South America. It is originated in Mexico and Guatemala and there exist its various types. Sweet pepper was started to be grown 700 years before the BC while hot pepper was grown 2000 years before the BC. China, Mexico and Turkey are main producers of 70% pepper in the world. During 1998-2007 in European countries the share of hot pepper in the world import made 43,8%, for example, in Germany - 18,9%, England - 7,2%, France - 6,9%, Holland - 4,8%, Italy - 3,6%, and in Czechia - 2,4% [1].

The demand in the world for hot pepper has increased up to 6,6% in 2000-2007 and in Europe to 6,3%. Only a few part of hot pepper is consumed in fresh form. More than 90 percent of hot pepper is used in processed form, and also for production of various preparations, aromatizers, powders and others. Because when it is processed, its value increases from 3 to 30 times. In recent years greater attention is paid for increasing productivity of pepper crops, selecting and developing new varieties, improving technology of its cultivation in the world. Therefore, selection of hot pepper varieties, planting scheme and planting time, seedling density in the field are considered as prior scientific questions of today [6].

In order to raise the capacity of food production in the republic, to enrich their types and to supply people with them regularly, to increase export potential and in result to ameliorate rural life style and rise rural benefits, the cultivation of hot pepper is fixed as one of the prior tasks in the decree of the President of the Republic of Uzbekistan dated December 29, 2015 PD-2460 "About the measures on further reforming and development of agriculture in 2016-2020" and order of the President of the Republic of Uzbekistan PO – 4947 dated February 7, 2017 "About optimizing crop lands and crop content, application of advanced agro-technologies and raise productivity, increase cultivation of fruit-vegetables and vine products" and "Actions strategies of the Republic of Uzbekistan during 2017-2021", a decree of the Cabinet of Ministries of the Republic of Uzbekistan number – 62 dated January 27, 2018 "About the measures on increase of cultivation of hot pepper in the republic basing on foreign experience".

In view of implementation of these tasks, scientific-research institute of vegetable, melon and potato growing has planted and studied 35 variety samples of hot pepper in greenhouse conditions which were brought from abroad.

Pepper fruit contains sugar (glucose, fructose and saccharose), organic acids (malic, citric and oxalate acids), flavonoids (meletin, hesperidin, apine, vitexin and others), vitamins C, B1, B2, B6, P, PP and E, carotene, folate acid, essential oil, saponin, oil, protein, minerals (potassium, natrium, calcium, ferrum, aluminium, phosphorus, sulphur, chlorine and salts of other elements and other matters. Hot pepper fruit is rich in many vitamins (particularly carotenoids) and capsaicine which adds them bitter and sharp taste, and other alkaloids. And its seed contains oil too [2].

In comparison with technical maturation of hot pepper at biological maturation its fruits contain 1,9 times more dry matters; quantity of sugar is 2,74 times more; acids are 2,3 and quantity of vitamins C is 3,64 times more. Nowadays

in scientific medicine hot pepper with large sized fruits is used. Hot pepper rouses appetite, increases gastric juice extraction, refines food digestion in stomach and it has tickling effect too. Therefore, a fruit extraction in the form of tincture is used for improving appetite and digestion. Hot pepper tincture is commonly used for eising of pain by smearing it on painful part of the body after neuralgia, radiculitis, myositis and other catarrhal diseases. But if the tincture (or hot pepper) is used over the norm it may cause pain and disorder in stomach-intestinal system, and much smearing it on the body results in skin burning [7].

Pepper tincture includes to ointment group which is smeared on painful, frozen and injured parts of body after catarrhal diseases (neuralgia, radiculitis, myositis, rheumatism and others), liniment group of complex pepper, sticking pepper plaster and other drug groups. Furthermore, the tincture is used turn by turn with sunflower seed oil against the above-mentioned diseases by smearing on skin [3].

Hot pepper belongs to the family of solanaceous culture and is annual grassy plant. This crop is differentiated from other crops by its heat, moisture and soil nutrients requiring feature and by its long growth period. Pepper is a light-lover plant. Lack of light for pepper causes flower falling, less fruit production and decrease in productivity [4, 5].

2. MATERIALS AND METHODS:

The experiments were conducted in the experimental fields of scientific-research institute of vegetable, melon and potato growing. All the variants and duplications were gathered in one field. Margilan 330 and L-15 varieties of hot pepper were planted in the experiment. The experiments were carried out on the base of the methods of Y.Y.Glushenko, M.V. Voronina, A.I. Strekalova about "Methodological instructions on the study and improving of solanaceous culture vegetables (tomato, pepper, eggplant) of the world collection", V.F. Belik "Methods of vegetable and melon growing experimentation", B.J. Azimov, B.B. Azimov about "Methods of experimentation on vegetable, melon and potato growing".

3. RESULTS AND DISCUSSIONS:

Before planting seedlings in experimental area, its soil was analyzed. The samples for soil analysis were derived from three parts of greenhouse. Soil alkalinity, amount of humus, salts, active amount of potassium, phosphorus, nitrogen, calcium and magnesium per kg of soil are identified.

Table 1

Analysis of soil content in unheated greenhouse area

№	Samples	pH	Humus,%	Salts, %		Active in one kg of soil, mg/kg				
				Cl	SO_4	N_2O_5	P_2O_5	K_2O	CaO	MgO
1	The first	6,8	1,36	0,005	0,004	21,9	36,3	214,5	0,044	0,038
2	The second	6,6	1,22	0,006	0,008	18,6	30,8	217,5	0,043	0,033
3	The third	6,2	1,10	0,005	0,007	30,2	33,7	215,8	0,046	0,037
	Medium	**6,5**	**1,23**	**0,005**	**0,006**	**23,6**	**33,6**	**215,9**	**0,044**	**0,036**

Soil solution (acidic, neutral, alkaline) impacts on the state and quantity of microorganisms and feeding regime of green plants through them. Acidic condition of soil (abundance of free hydrogen ions) can be active and its activeness depends on dimensions of pH. Here, if pH is 7, then it is regarded neutral reaction condition in which exist similar hydrogen and carbon dioxide ions. In the soils under acidic condition if pH is lower than 7, then in alkaline conditioned soils pH is over than 7. Reaction border of soil solution is large and may vary from pH – 3-3,5 (in peat soil) to pH – 10-11 (in salty land), reaction of soil solution depends on climate, plants, solid matters, ground water, lay of the land, fertilizers and other factors. In our experimental lands pH makes 6,5 of acidic condition.

Humus is an integral part of soil and it constitutes of collection of complex organic matters which formed from decomposition of organic matters of soil by microorganisms. Humus and its content indicate all features of soil from its view to fertility level. In experimental area humus amount makes average 1,23%.

Soil salinity causes to decreasing in crop yields. Plants cannot grow and may die in strongly salty lands. Water transferring to plant cells occurs slow in salty soils, because salt raises concentration of soil solution. In this case soil dryness phenomena may occur due to higher osmotic pressure of soil solution than osmotic pressure of cell juice, it keeps water and plant cannot get this water. It is obvious on the given data that Cl anion amount was average 0,05 % in the level of 0-20 cm and sulphate SO_4 ion was 0,06%. Gross amount of phosphorus (P_2O_5)was average 33,6 mg in 20 cm, gross amount of nitrogen (N_2O_5) was 23,6, gross potassium was (K_2O) 215,9, calcium oxide (CaO) 0,04 and magnesium oxide (MgO) made 0,036 mg as per kg of soil.

At 13°C and over temperature of soil the seeds of hot pepper start germinating. For the growth of pepper optimal temperature is 25°C at noon and 15-18°C as for evening time. In the experiment at 13-15°C temperature seeds began germinating and sprouts appeared within 18-20 days, under 25^0C temperature the sprouts began growing within 8-10 days.

When the temperature was 11-13°C plants stopped growing and under 0,5-1,0°C temperature they died. Under the temperature 25-30°C they grew well. Less air and soil moisture and the temperature higher than 35°C shows negative impact on the growth of plants, in result, flowers fall down and productivity may decrease.

Pepper grew and developed well in fertile soil that was rich in organic fertilizer (manure) and had light mechanical content. In heavy soils the plant grew slowly, in hot days it was affected by withering.

Hot pepper requires soil moisture, and during its growth moisture should not be lower than 75-80% comparing to field moisture capacity. But comparing to tomato the hot pepper is less demanding for relative air humidity, and this plant grows and develops well under 55-60% moisture.

After sprout germination pepper grew slowly at the beginning of vegetation. It was required 55-60 days for complete formation of seedling to be pricked out and planted in the field. If there is enough soil moisture the seedling can adapt to soil and grow well. But it may not germinate at once. After 1,5-2,0 weeks by processing the soil sprouts appeared considerably. After 28-35 days plant growth occurred fast. After 60-70 days of rapid sprout germination the plant started flowering stage depending on pepper variety, after 80-85 days technical maturation of fruits was observed and after 115-120 days biological maturation occurred.

As pepper is heat-lover crop, its seedlings were planted when the temperature of 8-10 cm depth of soil reached to 13-15°C. The seedlings were planted in unheated greenhouses on the 20th of February.

Plant interval in planting scheme depends on the growth of plant stem. Planting scheme 90×15-20 cm or 70×20-25 cm was used for weak growing teat varieties; 90×20-25 cm or 70×25-30 cm for medium growing stem varities; 90×35-40 cm or 70×35-40 cm scheme was used for strongly and very strongly growing stem varieties. After planting the seedling were irrigated immediately, therefore they survived and developed well.

In order to produce abundant yield of hot pepper in the condition of unheated greenhouse, organic and mineral fertilizers were applied to the soil. At the processing of soil 25-35 tons of manure, 120 kgs of phosphorus, 250 kgs nitrogen and 120 kgs of potassium were applied per ha. During the growth stage the plants were irrigated five times by dropping-irrigation system. Next feeding was conducted when the seedling survived after planting and showed rapid folwering.

4. CONCLUSION:

As we stated above that pepper requires much moisture, optimal soil moisture for it should be 75-80% relative to field moisture capacity. If there is no efficient moisture in the soil, flowers and buds of plant may fall down resulting in low productiveness and low quality fruits. In the condition of unheated greenhouse hot pepper was irrigated 35 times by dropping system per ha in 250-300 m^3 quantity during its growth period.

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