

THE TECHNOLOGY OF PRODUCING EARLY AND CHEAP HARVEST OF POTATO IN SOUTHERN UZBEKISTAN

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The main idea of the Conference which was held in Uzbekistan was named "The resources of food producing project in Uzbekistan". It was held in 2014, June 7 and the President of the Republic of Uzbekistan noted out in his speech that the experiments on security of food providing has being done by international experts and a complicated situation is now in the world and in some other regions brings us to serious anxiety. Nowadays this is the most urgent and serious problem for the World Society.

According to the information from UN's Food and Agricultural Organization and World Health Protection Organization, at present more than 840 million people e.i. 1\8 of people can't eat enough, 30 percent of population of the world gets not enough food too, suffer from the lack of the most important food microelements and vitamins. Because of these reasons more than 160 million children have got shortage in intellectual and physical growing.

The potato is one of the most important plants for providing food security in the world. That's why much attention is being paid in Uzbekistan for developing its production and widening fields. New varieties and growing technologies have been brought from foreign countries such as Holland and Germany. But the need for potatoes is satisfied as 75-80 percent, and in Surkhandarya region the productivity is 16-18 tons from 1 hectare.

The soil and climate condition of Surkhandarya region i.e. short and warm winter, 240-260 days of no cold, the amount of productive temperature is 5700-5900 degrees, in spite of yearly sediment is 130-360 mm, the existence of artificial irrigation system gives us an opportunity of producing much, good quality and cheap harvest of potatoes.

Since Independence the area of potato producing has been widened to 6 times and it's more than 6500 hectare now and potato producing volume is 105.9 tons.

The potato production increase in southern parts of the Republic much depends on selection of early harvest varieties, stability or resistance to weather conditions, to forming of tuber and enough of productive reproducing, the variety and planting quality according to certain standard and finally making up good quality producing technology. That's why it should be selected the certain variety to the certain condition for getting high early harvest we must have scientifically approved methods of time and depth planting.

The highest harvest and useful for health, economically clean is produced in mountainous are while potatoes have been grown in different geographical regions (Balashev, Zeman, 1964; Astanakulov, 1991; 2008; Zuevet et al., 2005). The mountain climate is good for potatoes growing, developing, good harvest and tuber mostly for its temperature.

The light intensivity, the prolongation of daytime, the radiation of the Sun spector is very important for the potatoes. The potatoes plant is the Sun loving (Brown, 1983; Moll, 1985; Astanaku-
lov, 1991).

As Zuev et al. (2005) point out in that a very sufficiently fertilized field the plant of potatoes grows up very intensively and the potatoes shrubs become very tight and there is no enough sunlight for the plant.

For enough sunlight the field for planting should be changed.

Early variety of potatoes gives good harvest when planted in mountain and premountain area and also in sandy mechanic composition soil and virgin, grass virgin area (Astanakulov, 1991).

Astanakulov (1991), Streltsova et al. (2007) point out the increase of potatoes harvest in certain soil-climate condition and for growing its production it should be correct variety selection and good quality seed for planting.

MATERIAL AND METHODS

The object of research. The fields for experiments were chosen in Surkhandarya region irrigated polar white colour virgin soil conditions. The mechanic compositions is average sandy and the depth of underground syzot water is 8-10 meters. The altitude of the farm is 450-470 meters. There was in the layer of 0-30 cm with gumus composition of 1.18 – 1.20%, nitrogen – 0.11-0.12%, phosphorus – 20.4-22.6 and recharged potassium 194-201 mg/kg in the experiment field.

As the object of experiment 3 precocious varieties of potatoes were chosen. Likaria, (Germany 2000), Latona (Holland 2001), Quvonch-16/56m (SamAI 2004), 7 average ripening varieties Santer (Holland 2000), Kondor (Holland 1998), Marfona (Holland 1998), Granola (Germany 2002), Palma (Germany 2000), Yaroqli-2010 (SamAI 2004).

The area delyanka (delyanka – some small areas chosen before planting) for each variety was 56 m² and the number of repetition was 4. All the varieties were planted on February 10-12 on scheme 70 x 25 cm at a depth of 6-8 cm.

According to the time of planting the area of delyanka was 448 m², and the experiment was 3 times repeated.

Planting scheme was 70 x 25 cm and based on learned material for time and depth the weight of selected varieties was 50-60 g whole and cut form with one time reproduction.

Methods of Research. Fields and experiments area planting, vegetation process, harvest, calculation and analysis were recommended by the Ministry of Agriculture (1984, 1989, 1990), Russian Institute of Plant Leaning (1984, 1986), Russia Scientific Potatoes Research Institute (1967, 1989), Uzbekistan Vegetables, Legume and Potatoes Scientific Research Institute (1978), State Commission on testing of new varieties of agricultural plants (1974).

The following methods have been used in defining gumus in soil by Turin, total nitrogen, phosphorus, potassium by Malceva and Gricenko, nitrate nitrogen Granvald – Lyaju, ammonium nitrogen on Nessler reactive the mechanic composition of soil by Kachinskiy, processing phosphorus by Machigin, Changing Potassium method by Protasov.

Climate. The climate of province is sharp – continental, very hot and dry, changing of temperature in seasons. The winter is mild and warm. Average temperature in January is 3 – 7 °C in June 39 –

41 °C. This month the temperature in Termez and Jarkurgan reaches as high as 48 °C (Alibekov, 1986).

The change of climate is because of high altitude of mountains, valleys wide location. In summer there are almost no precipitations. Most precipitations are in autumn and winter months with weather changing. According to the information, yearly precipitation is 147.3 mm. Average year temperature according to many years information is 16.3 °C, the lowest temperature is – 0.4 °C wind speed in summer is 7-8 meters per second. Some years in summer months there is hot wind called garmsell and its influence is negative to plants' developing. The most part of precipitations takes part in autumn, winter and spring. Almost no precipitations in summer. The lowest yearly temperature is in January (-6 °C) the highest is in June (+46 °C). The amplitude of average temperature in January is 16.1 °C.

RESULTS AND DISCUSSION

The results of precocious and average precocious varieties of potatoes growing, development and productivity study in southern region condition

The plant's growing and developing is closely connected with each other and fulfils each other.

Growing is a process of quality change new cells, tissue and bodies formation, weight and quantity increase.

Development is changing of the plant by quality, takes place in growing point and forms generative bodies and ends with fruit forming.

In our experiment precocious and average precocious varieties of potatoes were planted in early spring in seed sprout form and phonologic observation was being held.

During the observation the seed sprout growth, budding, flowering and stem yellow phases beginning was (10%) and completely finishing (75%) terms with each variety were observed. All tested varieties were planted in February 10 - 12 according to the scheme 70 x 25 cm, 4 times.

The studied variety of precocious and average precocious potatoes growth was observed for 19 - 22 days and budding process of every variety was 28 - 22, flowering took place 7 - 12 days and the prolongation of growing period was 75 - 86 days.

The studied precocious and average precocious varieties of potatoes' growth season (30-33

days) (7 - 10. IV), 40-43 (17 - 20. IV), 50-53 (27 - 30. IV), 60-63 (7 - 10. V) and 70-73 (17 - 20. V) biometric measures were processed. The growth period of all studied varieties of potatoes was from 30-33 to 60-63 days observing the intensive growth of light and development. After 40-43 days of growth the height of all varieties were 44-53 cm and the next 70-73 days the height was 61-76 cm.

The most side stems (17-18 pieces) were in Kondor, Mondial, Yaroqli-2010 and Sante the least (11-13 pieces) in Quvonch-16/56m and Latona.

More information about precocious and average precocious variety potatoes experimented for 30-33 days for all varieties in one shrub the number of leaves was 42-60 and the growth period 40-43 and 60-63 was increasing according to the natural law. The next 70-73 days in all varieties there were 134-194 leaves.

The most number of leaves (1 shrub – 194 leaves) was in average precocious Kondor, the least (134 leaves) on Latona.

Harvest sprouting process was observed in all varieties of growth potatoes in southern condition. After 30-33 days of growth there was 40-85 g of sprout in one shrub, and furthermore after 40-63 days the sprout weight was increasing reaching 376-572 g after 70-73 days.

In this condition all tested varieties of precocious and average precocious potatoes tuber sprout planting in early spring was done according to the scheme 70 x 25 cm, 4 different times the density of shrub in one hectare was 54.8-57.0 thousand or it compiled 99.1 – 99.8%.

Precocious and average precocious varieties standard Likariya growth in southern region was compared to Quvonch – 16-/56 m variety and the difference was 1.2 t/ha or 105% average precocious Sante compared to Kondor and Yaroqli-2010 varieties got the harvest of 107.1 – 115.4% i.e. 1.8-3.9 tons of high quality product.

The highest harvest product (28.3 t/ha or 15.4% extra high product) was Kondor variety planted to compare to standard variety. Comparatively high harvest was produced (7.1%) by average precocious Yaroqli-2010 variety. Precocious Latona variety have been studied and its productivity in comparasion to standard Likariya was 8.7%, average precocious varieties of Marfona, Granola, Mondial and Palma compared to Sante was 6.3 – 16.2% harvest difference.

Convenient time and depth marking results of selected potatoes varieties

There was one type soil-climate condition in our experiment and also the same shrub density and fertilizing and we had found out from the studied perspective varieties; Quvonch-16/56m, Likariya varieties and average precocious Kondor, Yaroqli-2010 and Sante varieties being selected, their seed sprout planting 3 different times (1 - 2; 10 - 12 and 20 - 22 February) 3 types depth (6 - 8, 10 - 12 and 14 - 16 cm) influence have been studied.

Phonological observation was carried out while selected perspective varieties of potatoes tuber were planted different time and different depth.

During the observation the perspective varieties of potatoes tuber growth activeness, growth, budding, flowering and finishing periods were observed.

Precocious variety of potatoes Likariya, Quvonch-16/56m average precocious (Sante, Kondor and Yaroqli-2010) varieties selected for southern conditions, seed sprout planted different and depth the growth was observed after 16-29 days, the field productivity composed 98.1 – 99.8%.

Average precocious varieties of potatoes planted early (1 - 2. II) at the depth of 6-8 cm growth 24-26 days and in precocious varieties the growth was observed after 21-23 days. When planting was late (20 - 22. II) the growth was observed after 16-18 days.

When planted early (1 - 2. II) varieties of potatoes have been grown after 30-33 days budding process started, flowering was observed after 9-11 days. The period between stem turn yellow and flowering was 38-47 days planted time and depth and the period between stem turn yellow and harvest lasted 1-25 days.

Precocious potatoes varieties growth season and depended on depth of planting was 75-80 days average precocious varieties 83-89 days and it was 2-3 days longer for the varieties planted early and shallow (6-8 cm).

The highest plants (71-81 cm) of potatoes selected varieties planted early (February 1-2) at the depth of 6-8 cm were observed. In this case the varieties of potatoes at the period of 30 days' growth the height of the plant was 31-42 cm and the next 40-60th days the height of the plant to the 70th day i.e. in May 19-20 was 71-81 cm or to 2-11 cm more than other varieties.

Table 1. Changing of a plant stem weight of selected potato varieties in different time and depth

№	Experimental variants		A plant stem weight, grams				
	planting time	planting depth	dimension time				
			9 – 10. IV	19 – 20. IV	29 – 30. IV	9 – 10. V	19 – 20. V
Average-precocious potato variety Sante							
1.	1 – 2. II	6-8	182	260	312	350	369
2.		10-12	173	254	301	336	348
3.		14-16	160	240	286	320	333
4.	10 – 12. II	6-8	171	248	304	336	350
5.		10-12	160	230	290	325	328
6.		14-16	147	209	270	301	310
7.	20 – 22. II	6-8	156	232	288	320	319
8.		10-12	141	218	273	303	306
9.		14-16	130	195	246	277	292
Average precocious potato variety Kondor							
10.	1 – 2. II	6-8	214	284	375	382	404
11.		10-12	192	277	360	371	376
12.		14-16	181	256	322	347	362
13.	10 – 12. II	6-8	205	271	363	375	389
14.		10-12	186	255	342	361	355
15.		14-16	170	243	307	319	340
16.	20 – 22. II	6-7	182	264	347	361	365
17.		9-10	156	238	331	348	352
18.		12-13	148	219	293	307	318
Average precocious potato variety Yaroqli – 2010							
19.	1 – 2. II	6-8	193	275	348	376	388
20.		10-12	181	263	319	356	376
21.		14-16	175	251	296	324	352
22.	10 – 12. II	6-8	186	260	319	352	373
23.		10-12	172	248	303	340	346
24.		14-16	158	232	283	309	333
25.	20 – 22. II	6-8	169	249	295	340	361
26.		10-12	154	230	284	318	352
27.		14-16	143	208	252	289	308
Precocious potato variety Likaria							
28.	1 – 2. II	6-8	170	246	303	341	353
29.		10-12	161	233	288	323	335
30.		14-16	147	218	263	301	324
31.	10 – 12. II	6-8	165	238	294	330	342
32.		10-12	153	229	276	310	319
33.		14-16	135	197	245	293	312
34.	20 – 22. II	6-8	155	217	283	314	330
35.		10-12	140	205	260	287	301
36.		14-16	122	185	223	270	293

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Precocious potato variety Quvonch – 16/56 m							
37.	1 – 2. II	6-8	190	270	354	360	362
38.		10-12	181	265	341	347	345
39.		14-16	160	242	299	319	337
40.	10 – 12. II	6-8	182	260	340	351	356
41.		10-12	173	246	321	333	340
42.		14-16	151	230	286	302	324
43.	20 – 22. II	6-8	161	240	290	311	340
44.		10-12	145	230	278	302	314
45.		14-16	136	202	261	293	302

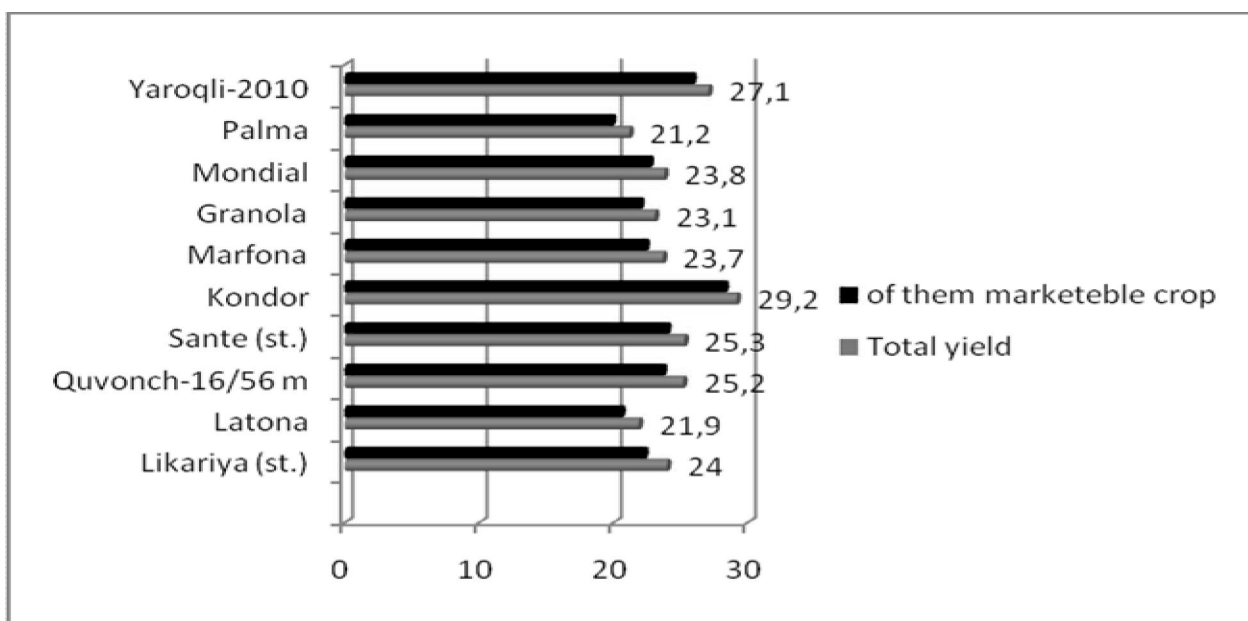


Fig. 1. Productivity and product yield, t/ha

Precocious and average precocious varieties of potatoes in Southern condition planted different time depth growing the leaves level changing was studied.

The studied potatoes varieties registered in a certain condition at the beginning of growing process (9-10. IV) the area of one stem leaves was 0.20 – 0.55 m² and the next 40th -60th days the area of leaves was increasing and by the end at the 70th day (19 - 20. V) it was 0.84-0.98 m².

So the selected varieties of potatoes to be planted in Southern Surkhandarya province using convenient planting time and depth we had depth we had productive strong stem and leaves area possibility condition.

In our experiment vegetative bodies (stem, leave and side stem) changing and root system formation was experienced in Southern Surkhandarya.

In southern condition planted different time and depth varieties of potatoes from the 30th to 70th day of growth and 0-20 cm depth the mass and the volume increasing had been observed.

Different planting terms and depth growing varieties of precocious and average precocious potatoes under observation and measurement i.e. the 30th day or April 9-10 soil slide 0-20 cm the mass of one root was 13.6-20.4 g, root volume 14.1-21.0 cm³, the 40th – 60th days this indication was increasing according to the biological law, and the 70th day i.e. May 19-20 the root mass of one plant stem was 17.3-28.0 g, root volume was 19.5-29.1 cm³.

In this condition forming of the highest root mass and volume of early potatoes planted that's on February 1-2, shallow or potatoes varieties planted at a depth of 6-8 cm has been studied

and at the beginning of growing season i.e. on 30th day or on April 9-10 at earth's stratum of 0-20 cm, a plant root weight is 16.6-20.4 g, the root volume forms 17.3-21.0 cm³ and as a rule in 40 – 60th days of growing season it shows more and at the end of growing season i.e. on the 70th day or on May 19-20, by varieties, it has been learned that a plant root weight was 17.8-28.0 g and the root volume – 20.6-29.1 cm³.

As is generally known, potato plant doesn't demand soil moisture much at elementary phase of growing season. But at the end of branching and at the beginning of blossoming phase its demand for soil moisture rises rapidly. If there isn't enough soil moisture in this season it influences badly to moving organic substance to potato stolons. At the result, forming of tubers will be late. Watering late causes tuber to begin propagating and at the end it harvests poorly. Because of that, on our research work we carried out an experiment on the soil moisture at completely blossoming season, by varieties studied and experimental variants, its changes have been elucidated. In order to make sure the soil moisture the samples were tested at the planting season, at a depth of 10 cm, during every 3 hours that's at 8 a.m., 11 a.m., 2 p.m. and 5 p.m.

Early planting i.e. on February 1-2 on the potato fields, by potato varieties the soil moisture was 14.9-15.8% at 8 a.m. and at 5 p.m. it was 13.3-14.8 that's 0.8-1.6 percent became lower (Table 1).

Late planting i.e. on February 20-22, the moisture was 14.1-14.9 and 13.2-14.0 and all day the moisture diminished to 0.6 – 10.0%.

When potatoes plant was planted early (February 1-2) at 8 a.m. the moisture was a little higher than late planting (February 20-22) that's the moisture was 15.0 – 15.6% and it had been steamed all day, at 5 p.m. the moisture was 13.4 – 13.8% that's it was less 1.8 – 2.0% than the morning's. By studied varieties, there weren't sharply differences in changing of the moisture. But when early planting it has been studied that the moisture is higher in the mornings and lower in the evenings. When potato variety Kondor was planted at the depth of 6-8 cm and 10-12 cm on February 1-2, the soil moisture was 15.4 – 15.6% at 8 a.m. and this variety was planted on February 20-22, the moisture was 14.2 – 14.6% at 11 a.m., it was 15.2 – 15.4 and 14.1 – 14.5% at 2 p.m. it was 14.6-15.0 and 13.7 – 14.0% at 5 p.m., it was 13.6

– 14.8 and 13.5 – 13.6% and the moisture was lower 0.8 – 10%.

In general, if potato varieties are chosen correctly, planted in time and at a convenient depth the moisture and temperature will be regularly. At the result, these experimental ways influenced well to tubers to form and grow intensively.

In southern Surkhandarya when precocious and average precocious selected potato varieties were planted in different time and depth a plant stem weight, forming of tubers and their influence to the plant stem weight and fertility index were studied.

It has been experimented that in various time and depth precocious potatoes varieties particularly average precocious potatoes varieties at the beginning of growing season that's on 30th day of it or on April 9-10 a plant stem weight is 122-214 g, on 40th – 60th day of growing season a plant stem weight exceed day by day and at the end of growing season that's on 70th day or on 19-20 its weight is 293-404 g.

And it has been differed that the highest plant stem weight in this condition, when potatoes varieties are planted at a depth of 6-8 cm on February 1-2, at the beginning of growing season that's on the 30th day or on April 9-10 a plant stem weight is 170-214 g. On 40th – 60th days a plant stem weight exceeds day by day and at the end of growing season that's on the 70th day or on February 19-20 its weight is 353-404 g. This index was differed noticeably when we experimented among precocious varieties Quvonch – 16/56, Yaroqli – 2010.

Productivity

The highest productivity of the potato varieties selected in southern condition was gathered in 22.8 – 29.5 t/ha when it was planted and grown on early February 1-2, at a depth of 6-8 cm. Then the extra productivity showed 3.0 – 7.5 t of harvest from a hectare, by varieties, than the grown harvest in late 20-22th of February.

Product harvest showed 15.3 – 29.1 t or 94.4 – 98.8% and the expense of seed harvest was 8.1 – 13.4 t or 44.6 – 60.1% when the varieties of potatoes selected in this condition were planted and grown in different time and depth.

The highest product and seed productivity, the varieties of potatoes which selected in southern condition were gathered when they were grown on early February 1-2, at the depth of 6-8 cm. Planting at a depth of 6-8 cm and in convenient

planting season (1-2th and 10-12th of February) of selected potato varieties was intensely distinguished than the standard varieties and experimental variants. The highest extra productivity (113.3 – 114.8%) was taken, by varieties when average precocious variety of potatoes Kondor was planted at a depth of 6-8 cm or 10-12 cm.

The highest extra productivity, by varieties, 2.1 – 6.2 t or 108.2 – 126.6% from a hectare was registered in the experiment in a convenient planting season on February 10-12 and extra productivity depends on the depth and it didn't increase from 0.4 – 2.7 t in a hectare, even carrying out the planting process at a depth of 14-16 cm caused to diminish the productivity till 3.7 tons in a hectare.

So we recommend to gather 25-28 tons or more productivity of potatoes from where was anciently irrigated on the condition of bright colored virgin soil in southern continent and to plant and bring up the selected varieties of potatoes in a convenient planting season (the first half of February) and at a depth (6-7 cm) for gaining 22-25 tons of product harvest from a hectare and 13-14 tons or more seed harvest.

CONCLUSIONS

Growing, developing of precocious and average precocious potato varieties, forming of stem and tubers on the condition of anciently irrigated bright colored virgin soil of Surkhan oasis – southern continent of Uzbekistan, were noticeably differentiated and 21.2-29.2 tons of productivity was gathered from a hectare. Precocious varieties of potatoes Quvonch-16/56m, Likaria and average precocious varieties of Kondor, Yaroqli-2010 and

Sante which had a high productivity, product and seed quality and suited to this condition were selected.

When selected precocious and average precocious varieties of potatoes were grown in different planting periods and different depths the productivity changed into 29.5 tons from 17.6 tons from a hectare and the highest productivity (22.8-29.5 t/ha) on varieties were gathered when they were planted early (February 1-2) and at the depth of shallow (6-8 cm). As a result, it was gained 5.2-7.5 t/ha or 29.5 – 34.1% extra productivity than the late (February 20-22) and deep (10-12 cm) planting.

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