

# Selection of White Cabbage Variety Samples Those are Cultivated in Uzbekistan Conditions

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**Abstract:** *There were 8 varieties and 6 F<sub>1</sub> hybrids in total 14 white cabbage sorts were used in this study. The variety Saratoni has been used as a standard for comparison with them. According to the 4-year research data, the average weight of the cabbage head was 3,2 kg, and compared to that cabbage heads were larger in Geant F<sub>1</sub> for 128,1%, Kozak F<sub>1</sub> –121,9% and in W61-19 F<sub>1</sub> for 128,1%. The average yield of white cabbage samples has been various during 2007-2010. The yield has been 95,7 in standard variety and in comparison to that the yields have been higher in Geant F<sub>1</sub> (131,2 t/ha) – 137,1%; Kozak F<sub>1</sub> (124,8 t/ha) – 130,4% and W61-19 F<sub>1</sub> (129,6 t/ha) or 135,4% higher than standard variety. Productivity indicators were significantly higher than HCP<sub>05</sub> (1,8-3,9 t) and the accuracy of the experiments was higher for 1,7-4.3%.*

**Keywords:** white cabbage, seeds, plantlet, headed cabbage, varieties, hybrids, yield.

## 1. Actuality of the Topic

White cabbage is cultivated as a main vegetable in wide range in our Republic, which is associated with high consumption of this vegetable by local people and its medicinal properties. White cabbage is characterized by its high content of sugar, protein and cellulose. This vegetable's leaf contains lemon acid and it aromatic effects on the organism. White cabbage is rich in mineral salts, especially potassium, which helps to reduce muscle contraction and serves for the movement of many enzymes. Potassium helps to excrete excess water and sodium salts in the organism. Cabbage is also essential for patients with heart disease. The white cabbage contains vitamins B<sub>1</sub>, B<sub>2</sub>, E, K and P. Inosine, which belongs to B group vitamins, has like ascorbic acid the ability to prevent atherosclerosis in human. The healing compound of sclerosis disease, which is choline three times as much in cabbage content comparing to fish and flesh. New and salted cabbage improves digestion and enhances bowel activity. Fresh juice that prepared from cabbage leaf is an effective remedy for the treatment of gall bladder, stomach inflammation and gastritis [1].

In traditional folk medicine, cabbage is used against drowsiness, headache and enlargement of thyroid gland, and new leaves of cabbage are placed in ulcers, stomach ulcers, duodenal ulcers, burns and wounds [2].

In 2017, 74 varieties and hybrids of white cabbage have been registered in the State Variety Register Authority of Uzbekistan, of which only 7 or 9,5% were developed in Uzbekistan. Therefore, the expansion of cauliflower varieties is an urgent problem in Uzbekistan and the main purpose of the studies.

## 2. Materials and Methods

Studies were carried out in the chair of vegetable production at the Tashkent State Agrarian University during 2007-2010. There were studied 6 local varieties, which have been registered in State of white cabbage and 8 foreign varieties and hybrids.

The following methodological guidelines were used in this research:

“Methodical instructions for studying the collection of cabbage and leafy green cultures” [3], “Determination of the stability of cabbage to low temperatures by the method of prototypes” (guidelines) [4], “Methodology of the State Variety Testing for Agricultural crops” 4<sup>th</sup> issue [5], “Methods of field trials for vegetable production and melon production” [6], “Agricultural trials in crop production and its methodology” [7], “Planning of field experiments and statistical processing of its data” [8], “Methodical instructions on mathematical processing of yield data of competitive variety testing of agricultural crops” [9],

## 3. Results and Discussions

Selection of new varieties in selection works, regardless of the type of the crop, is important. In our experiments 6 different white cabbage varieties have been used, which were developed in various years in Uzbekistan and registered in the State Variety Register Authority, and as well were used 8 foreign varieties and hybrids.

Time periods of registration of local varieties of Uzbekistan by State Variety Register Authority: “O‘zbekiston sudyasi” (1946); Tashkent-10 (1957); Saratoni (1995); Sharqiya-2 (2002), Termez-2500 (2004) and Toshbosh.

Sutra and Sudak foreign varieties of cabbage belong to selection of Netherlands and 6 F<sub>1</sub> hybrids have been developed by France breeders. Here Saratoni variety was applied as a standard for comparison.

According to phenological observations 40 day-plantlets of Saratoni standard variety started to give headed cabbage. In comparison to that standard variety the local varieties of white cabbage began to give cabbage heads 1-2 days earlier. The varieties of Netherlands started to give cabbage heads 3-4 days earlier than standard variety Saratoni.

In accordance to studies French hybrids Kubok F<sub>1</sub>, Geant F<sub>1</sub> and Kozak F<sub>1</sub> were defined as mid-ripening and others as

middle late ripening varieties.

The date of harvesting was for 9 varieties and hybrids on November 9; for varieties from Netherlands was on December 10, and for French varieties it was on November 16. Netherlands' varieties have been harvested due to their late ripening a little bit later. Duration of vegetation periods of the varieties and hybrids of white cabbage are determined until they harvested. Vegetation periods (from germination) can be as following: in early ripening varieties 100-120 days, in middle ripening varieties 130-150 days, and in late ripening varieties 170-180 days. Respectively, after planting of plantlets till to get cabbage heads it can be 55-65 days, 75-80, and 110-120 days.

Headed cabbages can be divided into small, medium and large types. The average diameter of the thickest head of the cabbage is greater than 10 to 18 cm in the small types, 20 to 25 cm in the middle and more than 25 cm in the large types. The height of the head of the cabbage was 23,8 cm in standard Sharqiya-2 variety, and nearest indicator (90,3-92,4%) to it were observed in varieties of Tashkent-10, Termez-2500, O'zbekiston sudyasi and Saratoni.

In Netherlands' varieties that were indicated as 74,4 – 76,5 %, in French hybrids were waving between 72,7-87,0%, in comparison to standard variety. When the average diameter of the thickest part of the headed cabbage were measured, there have not been identified any small types (10-18 cm) from the samples. There were identified 10 varieties with average 20-25 cm diameters. Termez-2500, O'zbekiston sudyasi, standard Sharqiya-2 and Saratoni varieties (26,4-28,0 cm) were identified as large types (bigger than 25 cm) (Table 1).

Shapes of headed white cabbages were 0,8-1,1 in round cabbages, 0,4-0,7 in smooth shapes, 0,4-0,7 in round-smooth, 0,8-1,4 in conical and 1,1-2,1 in oval shapes. There were have not been identified any varieties and hybrids with shapes round (0,8-1,1), smooth (0,4-0,7), conical (0,8-1,4) and oval (1,1-2,1).

Sutra, Sudak, Termez-2500 and O'zbekiston sudyasi varieties were identified as round-smooth shaped (0,76-0,80). The remaining samples have approached to an index with 0,8-1,1 and have had round shapes.

**Table 1:** Variety samples of white cabbage with indicators of height and width of headed cabbage. (2007-2010 years)

Variety samples	The height of headed cabbage		Diameter of cut headed cabbage		Index of headed cabbage	The shape of headed cabbage
	cm	%	cm	%		
Sutra	17,7	74,4	23,4	83,6	0,76	Round-smooth
Sudak	18,2	76,5	22,6	80,7	0,80	Round-smooth
Tashkent-10	21,8	91,6	24,5	87,5	0,89	Round
Sharqiya-2 st	21,5	90,3	28,0	100,0	0,77	Round-smooth
Saratoni st	21,8	91,6	27,7	98,9	0,79	Round-smooth
Termez-2500	20,3	85,3	23,3	83,2	0,87	Round
O'zbekiston sudyasi	23,8	100,0	28,0	100,0	0,85	Round
Toshbosh	22,0	92,4	26,4	94,3	0,83	Round
Kubok F <sub>1</sub>	19,1	80,3	22,6	80,7	0,85	Round
Geant F <sub>1</sub>	18,3	76,9	20,3	72,5	0,90	Round
Kozak F <sub>1</sub>	18,5	77,7	21,7	77,5	0,85	Round
Banoki F <sub>1</sub>	17,8	74,8	20,6	73,6	0,86	Round
Brady F <sub>1</sub>	17,3	72,7	18,2	65,0	0,95	Round
W61-91 F <sub>1</sub>	20,7	87,0	22,8	81,4	0,91	Round
$\bar{e}$	19,914		23,578	0,84	0,84	
$\bar{X}$	278,8		330,1			

Headed cabbages are divided depending on the size and intensity into small weight- 0,5-1,5 kg, middle weight- 1,5-2,5 kg and large weight- 2,5 kg cabbages. Irrespective of the types of crops, soil fertility influence strongly on their productivity (50-60%). Products and cabbage heads of white cabbage can be 1-2 times or even larger, when they are cultivated in fertile soils.

During the studies small weight (0,5-1,5 kg) of white cabbages were not identified between the samples. Remaining samples were identified as middle weight (1,5-2,5 kg) and large weight (2,5 kg) cabbage samples.

Average (2,1-2,3 кг) weight classification was achieved in Sutra and Sudak varieties. In standard Saratoni and Sharqiya-2 varieties, that was 3,2 kg. The same results (90,6-103,1%) were observed in the varieties of Tashkent-10, Termez-2500, O'zbekiston sudyasi, Toshbosh, Kubok F<sub>1</sub>

and Banoki F<sub>1</sub>. Comparing to standard Saratoni variety, the weights of headed cabbages were higher to 121,9 to 128,1% in Geant F<sub>1</sub>, Kozak F<sub>1</sub> and W61-91 F<sub>1</sub> hybrids (Table 2).

The average white cabbage yields, which were developed in different countries, were in 2007 as follows: Average yield of two Dutch cabbage varieties was 68 tons per hectare; yield of 6 varieties of Uzbekistan was 91,9 tons/ha and six French hybrids' yield was 97,8 tons / ha.

Results revealed that the yield of hybrids compared to varieties was significantly higher. French hybrids' yield was 6,4% higher and yield of Dutch hybrids was 26,0% higher than the local varieties of Uzbekistan.

The lowest yield difference for the year 2007 (HCP<sub>05</sub>) was 2,1 t / ha, the accuracy of the experiment was ( $S \bar{X}$  %) 1,7%. This is a good result. Comparing to the standard Saratoni variety with other varieties, their (2,1 t/ha) and

difference of HCP<sub>05</sub> was more reliable.

In 2008, the yield of standard Saratoni was 96,0 ton/hectare, and nearest result (between ± 10%) was observed in Tashkent-10; Sharqiya-2; Termez-2500, O'zbekiston sudyasi and Toshbosh varieties.

The yield was lower for 65,6-84,2 ton/ha comparing to the standard Saratoni variety in Sutra, Sudak, Banoki F<sub>1</sub>, and Brady F<sub>1</sub>, the higher yields 112,0-140,8 ton/ha were in Kubok F<sub>1</sub>, Geant F<sub>1</sub> and Kozak F<sub>1</sub> hybrids. According to yield EKMF<sub>05</sub> was 1, 8 ton/ha, the accuracy of the experiment was Sx%-2,1.

**Table 2:** Weight and yield of cabbage head of white cabbage variety samples, (2007-2010 years)

Variety samples	Weight of cabbage head		Yield, ton/ha				Mean for 4 years	
	kg	In comparison to st, %	2007	2008	2009	2010	$\bar{x}$	In comparison to st, %
Sutra	2,1	65,6	64,0	65,6	70,4	68,8	67,2	70,2
Sudak	2,3	71,9	72,0	67,2	78,4	80,0	74,4	77,7
Tashkent-10	2,9	90,6	89,9	88,4	74,4	86,8	84,9	88,7
Sharqiya-2	3,2	100,0	96,3	99,2	99,2	93,0	96,9	101,3
Saratoni st	3,2	100,0	94,4	96,0	99,2	93,0	95,7	100,0
Termez-2500	3,3	103,1	99,2	88,5	93,0	86,8	91,9	96,0
O'zbekiston sudyasi	2,9	90,6	89,3	99,2	68,2	93,0	87,4	91,3
Toshbosh	2,9	90,6	82,5	89,0	86,8	80,6	84,7	88,5
Kubok F <sub>1</sub>	3,1	96,9	81,0	112,0	96,0	105,6	98,7	103,1
Geant F <sub>1</sub>	4,1	128,1	108,8	140,8	128,0	147,2	131,2	137,1
Kozak F <sub>1</sub>	3,9	121,9	102,4	128,0	128,0	140,8	124,8	130,4
Banoki F <sub>1</sub>	2,9	90,6	89,6	83,2	96,0	102,4	92,8	97,0
Brady F <sub>1</sub>	2,7	84,4	83,2	76,6	89,6	96,0	86,4	89,9
W61-91 F <sub>1</sub>	4,1	128,1	121,6	128,0	128,0	140,8	129,6	135,4
HCP <sub>05</sub>			2,1	1,8	3,9	3,6		
$S\bar{X}$ % (the accuracy of the experiment)			1,7	2,1	2,3	4,3		

In 2009, the yield of variety standard Saratoni was 99,2 ton/ha, and relatively less (68,2-86,8 ton/ha) to it yields were in Sutra, Sudak, O'zbekiston sudyasi and Toshbosh varieties. Higher yields (128 ton/ha) than standard were observed in hybrids of Geant F<sub>1</sub>, Kozak F<sub>1</sub> and W61-91 F<sub>1</sub>. The yields of other varieties and hybrids were the equal with the yield of variety standard Saratoni. That year EKMF<sub>05</sub> was 3,9 ton/ha, and the accuracy of the experiment was Sx%-2,3%.

In 2010, the yield of standard Saratoni was 93,0 ton/ha, relatively less to it yield (68,8-86,8 ton/ha) were in Sutra, Sudak, Toshbosh varieties, high yields (140,8-147,2 ton/ha) were in the hybrids Geant F<sub>1</sub>, Kozak F<sub>1</sub> and W61-91 F<sub>1</sub>. The yields of other varieties and hybrids were the equal with the yield of standard Saratoni variety. In that experiment HCP<sub>05</sub> was 3,6 ton/ha, and the accuracy of the experiment was Sx%-4,3%. Additional yield was reliable in comparison to standard variety.

During the 4 years (2007-2010) the average yield of standard Saratoni variety was (95,7 ton/ha) and close to that yield had varieties (86,4-98,7 ton/ha) Sharqiya-2, Termez-2500, O'zbekiston sudyasi, Kubok F<sub>1</sub>, Banoki F<sub>1</sub>, Brady F<sub>1</sub>, and in varieties Sutra, Sudak, Tashkent-10, and Toshbosh were observed lower yields than standard (67,2-87,4 ton/ha). The higher yields 130,4-137,1% than standard Saratoni variety were observed in hybrids of Geant F<sub>1</sub>, Kozak F<sub>1</sub> and W61-91 F<sub>1</sub>. The difference between low-yielding varieties and high yielding hybrids was 1,65-1,95.

#### 4. Conclusions

White cabbage varieties, which registered by the State Variety Register Authority of Uzbekistan, were created on typical grey soils. We carried out studies with white cabbage

variety samples on grassy-grey soils. Due to the soil fertility according its properties the weight of headed cabbage was bigger 1, 5-2, 0 times.

The soil condition also influenced to morphological parameters of cabbage plants. The leaves of the cabbage were large and dark black. The outer core was thick. The weight of the cabbage head has affected on total yield parameters.

The yields of two Dutch hybrids were between 67,2-74,4 tons per hectare, and the yields of Uzbek varieties fluctuated between 89,7 and 96,9 tons per hectare. In comparison to those, the yields of French hybrids were 86,4-131,2 tons or mean per hectare was 97,8 tons. In our experiments, the yield of white cabbage hybrids has been higher for 20-25% than cabbage varieties.

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