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THE RESULTS OF SCIENTIFIC RESEARCHES CONDUCTED ON PRODUCING BIOETHANOL BY PROCESSING LOCAL VARIETIES OF SWEET SORGHUM AS A FEEDSTOCK IN THE CONDITION OF UZBEKISTAN

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ABSTRACT

In order to find alternative energy sources, to meet fully the livestock needs for feed and to save water resources, and in accordance with the results of researches conducted on the purpose of using bioethanol, that is a source of renewable energy, by processing sweet sorghum as a feedstock in three places of Tashkent region with different soil types like salty or bare soil and climatic conditions, the data was outlined about the coincidence of local varieties of sweet sorghum which features all the positive attributes, with the production of bioethanol fuel, establishing fuel producing facilities in Uzbekistan and by the system of regular provision with feedstock corresponding to the requirements for bioethanol fuel.

KEYWORDS: *Sweet sorghum, variety, bioethanol, syrup, saccharinity, green mass, sourness, raw material, local varieties, growth period, stalk, stalk juice, sour, juiceless.*

1. INTRODUCTION

A major part of bioethanol is produced in the world from sugarcane juice and corn grains. Sweet sorghum and grain sorghum can be alternative feedstock for the above-mentioned two traditional products.

If sweet sorghum and grain sorghum are compared with maize and sugarcane, bioethanol quantity is derived from sweet sorghum two times more than others. That's why according to analysis in the references the costs for cropping lands of sweet sorghum and its processing are less than other cultivations [12, 13].

As for P.P. Oleynik [9], in green mass of sweet sorghum grown in north lands exists 16% sugar while in southern sweet sorghum this indication is of 20-24 %.

Due to increase in the price of petrolium and deterioration of ecological circumstances, majority of countries in the world have been signing agreements on developing and producing ecologically pure renewable energy in order to eliminate the problems.

Today sweet sorghum is suggested as feedstock for bioethanol fuel instead of traditional fuel for transports by processing [6, 7, 9, 10].

As A. Abdurakhmanov stated that each hectar of land under sweet sorghum crop produces 3-4 tons of bioethanol fuel. In addition sorghum can easily grow in salty and incult land and this kind of land makes 250-300 thousand ha in our republic [11].

According to A. Ishin, out of one ton of sorghum grain 400-420 litres of bioethanol is obtained. Mean grain productivity of local grain sorghum varieties makes 4,5-6,0 tons, and it means 1,8-2,4 tons of extra bioethanol product [3,4,15].

One of the important biological attributes of sorghum is abundant sugar accumulation in its stalk juice and crop residue after processing is used as valuable feed for livestock. In stalk juice sugar varies from 13 % to 20 % . Mostly Balchin-greek and Kand-burug varieties are cultivated [2, 14].

As 45-55% land areas of Uzbekistan are under salinity of various level, one of the resistant crops for salinity, drought, heat and less water user is a sorghum. The scientists of scientific experimental station for maize selection and seed-breeding have created Uzbekistan 5, dwarf of Uzbekistan, Daulet, Massino varieties from grain sorghum group; Uzbekistan 18, Korabosh from sweet sorghum group; perennial Azamat variety from grassy sorghum group. The scientists of this station and Tashkent state agrarian university planted early-maturing variety of sweet sorghum "Korabosh" (100-105 days), medium-maturing "Oranjevoye" 160 (125-130 кун) and late-maturing Uzbekistan 18 (140-145 кун) varieties.

2. MATERIALS AND METHODS

During 2017-2018 in irrigated and mean salty lands of Zangiota, Kibray and Bekobod districts of Tashkent region by 100 thousand seedlings density in 4 rows of 3 ha area in 3 repetitions during the first decade of May. Experimental area was cleaned in late winter from the former crop residues, 75% of annual quantity of phosphorus and potassium was applied and tilled in 30-35 cm depth. In early spring the field was processed by harrowing with pulverizer in order to eliminate weeds, harrowing before planting, ploughing and subsoiling. Simultaneously with planting 25% of annual quantity of phosphorus and potassium was applied, and furrows were made ready. Seeds were planted after dividing the experimental field into plots. During the growth period the plants were irrigated 4 times, cultivated interrows 2 times, and were fertilized, phenological observations were conducted as well.

3. RESULTS AND DISCUSSION

At the period of phenological observation growth time duration of varieties, plant height, foliage quantity, panicle length and quantity of nodes in the stalk were measured and calculated (Table-1).

It is obvious in table data that the sweet sorghum varieties measured in Bekobod Tentsoy field were different comparing to other fields:

Table 1
Results of phenological observations on sweet sorghum varieties

Variety	Plant height, cm	Foliage quantity, pcs	Node quantity, pcs	Panicle length, cm.	Length under panicle, cm
Scientific-experimental station of corn selection and seed-breeding					
Korabosh	271,9	11,0	9,0	27,9	11,4
Uzbekistan 18	218,2	15,0	11,8	25,0	9,5
Oranjevoye 160	250,6	12,0	9,6	22,8	7,0
Experimental station of Tashkent state agrarian university					
Korabosh	238,5	9,0	8,7	27,6	18,0
Uzbekistan 18	201,2	12,0	9,3	27,0	7,0
Oranjevoye 160	201,5	10,0	8,3	20,1	10,0
Bekobod Tentsoy field					
Korabosh	281,2	12,0	10,0	26,9	7,4
Uzbekistan 18	260,5	19,0	13,0	28,0	12,8
Oranjevoye 160	279,7	16,0	12,0	22,1	6,3

stalk height was higher in Korabosh variety from 9,3 to 42,7 cm, Oranjevoye 160 variety 29,1 – 78,2 cm, in Uzbekistan 18 variety it varied from 9,9 – 59,3 cm, also it was observed that other indications of scientific researches held in Bekobod Tentsoy experimental field were higher comparing to other varieties. The purpose of the study of under panicle length from the first leaves consists of identifying how much amount of main part of crop is wasted or harvested if it is harvested by combine, finally it has been determined that when the yield is harvested by technics and if under panicle length is 7-12 cm, then it doesn't allow to the waste of yield.

On growing period of plants (panicle making, flowering, milk maturation) from each repetition 15 plants were selected and in laboratory condition stalk length, neat weight of leaf, panicle and stalk were weighed by laboratory scale (sartorius AY10000) and calculated total waste. With the help of juice extraction device (Siemens CNC j 03) stalk juice was extracted and by refractometer (PAL – 1) dryness quantity of stalk juice and by laboratory devices pH meter (pH – 100 ATS) alkalinity was determined (Table-2).

Table 2
Laboratory analysis results of sweet sorghum samples planted in the places of Tashkent region

Scientific Experimental Station of Corn Selection and Seed-Breeding						
Paniculating period						
Variety	**Total weight of stalk, gr.**	**Average weight of stalk, gr.**	**Leaf weight, gr.**	**Panicle weight, gr.**	**Dryness amount, %**	**Acidity (pH meter indicator)**
Korabosh	586,0	428	62	42	9,7	5,13
Uzbekistan 18	933,7	702,0	156,0	75,7	14,5	5,12
Oranjevoye 160	404,0	324	60	20	15,9	5,21
Flowering period						
Korabosh	576,4	438,7	59,7	78	11,6	5,21
Uzbekistan 18	1052,3	801,1	172,6	78,4	13,6	5,20
Oranjevoye 160	576,7	478,0	72,7	26,0	14,2	5,17
Milk maturation period						
Korabosh	616,7	481,0	71,4	64,3	13,8	5,18
Uzbekistan 18	1134,7	848,6	199,6	86,5	16,2	5,22
Oranjevoye 160	515,5	407,5	63,0	45,5	17,2	5,18
Experimental Station of Tashkent State Agrarian University						
Paniculating period						
Korabosh	619,3	425,1	69,2	123,0	9,3	5,38

Uzbekistan 18	616,7	500,2	76,3	40,2	9,33	5,26
Oranjevoye 160	289,2	240,1	37,1	12,0	11,0	5,18
Flowering period						
Korabosh	376,8	297,0	40,8	39,0	13,8	5,3
Uzbekistan 18	669,2	535,0	97,5	36,7	9,7	5,4
Oranjevoye 160	312,0	268,0	31,0	13,0	13,0	5,2
Milk maturation period						
Korabosh	493,4	349,3	85,2	58,9	15,6	5,24
Uzbekistan 18	923,5	758,1	103,7	61,7	17,6	5,32
Oranjevoye 160	310,0	256,0	30,0	24,2	18,4	5,40
Bekobod Tentsoy Field						
Paniculating period						
Korabosh	872	666,6	148,2	57,2	11,2	5,10
Uzbekistan 18	1127,2	822,6	214,2	90,3	10,2	5,18
Oranjevoye 160	947,8	751,9	152,2	43,7	11,4	5,15
Flowering period						
Korabosh	913,4	692,5	137,0	83,9	15,8	5,21
Uzbekistan 18	1202,3	937,8	174,3	90,2	15,2	5,27
Oranjevoye 160	1046,7	852,4	152,5	41,8	15,4	5,22
Milk maturation period						
Korabosh	936,2	767,7	111,7	56,8	18,0	5,15
Uzbekistan 18	1234,7	1012,1	155,5	67,1	20,2	5,20
Oranjevoye 160	978,5	839,5	90,2	48,8	19,4	5,16

The indications from the experiment showed the amount of bioethanol out of neat product per hectare and exact quantity of residue wastes for additional feed production.

During the analysis of laboratory results it was known that dryness amount in the juice content of varieties taken from Bekobod Tentsoy field soil with mean salinity and the received yield were lower than the varieties of other fields, for example, in Korabosh variety of sweet sorghum mean amount of dryness in growing period was 4,9-6,3% lower.

Green mass yield was around 34,7 tons per ha in scientific experimental station of corn selection and seed-breeding, in experimental station of Tashkent state agrarian university 28,9 tons, in Bekobod Tentsoy field 36,5 tons. There was difference of 1,8-7,6 tons on average yield of green mass.

The juice and residues of Uzbekistan 18 variety extracted from the stalk by special press in laboratory condition were sent for analysis to the laboratory of Institute of Plant matters chemistry under name of academician S.Y.Yunusov and received the following results (tables 3,4).

Table- 3

Analysis results of residues of "Uzbekistan 18" variety of sweet sorghum

№	Indications	Experiment results
1	Appearance	colour of sorghum nubbin, plant fibre
2	Colour	Grey
3	Smell	Specific for this type of plant
4	cinder, %	4,398
5	Fraction of total mass of humidity, %	41,37

Table -4
Analysis results of "Uzbekistan 18" variety of sweet sorghum

№	Indicators	Results of experiment
1	Appearance	Dreggy with liquid fermentation signs, fine suspension of various forms and more dark colours
2	Colour	Greyish-brown
3	cinder, %	4,398
4	Dry residual, %	23,55
5	Consistency, g/cm^3	1,080
6	Deflection indicator	1,35965

4. CONCLUSIONS

The following conclusions are to be given on the analysis results conducted on sweet sorghum in three places of Tashkent region of the Republic of Uzbekistan: Zangiota (experimental station of corn selection and seed-breeding), Kibray (Tashkent state agrarian university), Bekobod (Tentsoy) field:

- it was determined that high green mass yield might be obtained by planting Korabosh, Oranjevoye 160 and Uzbekistan 18 sweet sorghum varieties in the soils of various salinity levels;
- also it was detected that on main indications of bioethanol production sugar amount in juice content of sweet sorghum stalk was higher in fields with differently salted soils comparing to irrigated fields;
- in order to provide constant work of bioethanol producing facilities, working out system of purposeful placing of abovementioned varieties of sorghum in croplands for green mass production;
- identified the possibility of meeting the needs of livestock for stable feedstock in the regions of less water resources and in salted soil conditions by planting sweet sorghum and decreasing costs for fodder.

In the result of conducted researches it was defined that processed local varieties of sweet sorghum could be effective feedstock for bioethanol production.

5. REFERENCES

1. *Abdurakhimov A. Sweet sorghum is a source of benefits. Uzbekistan agricultural magazine, 2006, №6, p-18.*
2. *Auerbah A.A. Forage techniques. M., 1936. P-45.*
3. *Newspaper «Tasavvur» - Bioethanol instead of petrol, 25.09.08-01.10.08, p-12.*
4. *Newspaper "Toshkent hakikati" – Fuel from straw, №89 (12.205) 2009, November 7, p-5 .*
5. *Koshchanov Э., Rakhmanov A. – Producing automobile fuel from biomass. J: Ecology news, 2009. №12 (105). p. 21.*
6. *Lachuga Y.Ph. Unusual energy in agriculture / Perspectives, producing experience and using alternative types of fuel in agriculture: Coll. Scien.conf. – Zernograd: VNIPTIMESKh, 2007. p. 9–14.*
7. *Malinovskiy B.N. Problems, perspectives and using new energy technology in agricultural production. Russia – Coll.scient.conf. – Zernograd: VNIPTIMESKh, 2007.pp: 81–86.*
8. *Mukhammadjanov A. Alternative sources. Is sorghum instead of petrolem? Newspaper «Pravda» February 15, 2006 . p. 2-3.*
9. *Oleynik P.P. Sweet sorghum in central humus zones. Book. «Sorghum», M., 1961, p-125*
10. *Sadriddinov A.A. Future fuel. – J: «Agriculture of Uzbekistan», 2007. №2. p.3-4.,*
11. *Solovyev A.V., Kayumov M.K. Optimizing the sorghum sowing structure in Volga regions– J: Cereal culture, 2006. №7. pp. 26-28.*
12. *Khakimov B., Isokov S. Using bioethanol fuel in the world. – J: Agriculture of Uzbekistan, 2009. №10.p. 35.*
13. *Nimbkar N., x N., Akade J., Rajvanshi A. Syrup production from sweet soghum./ Nimbkar agricultural research institute. Phaltan. – 2006. P. 1-10.*
14. *Taylor J.R., Schober T.J., Bean S.R. Novel food and non-food uses for sorghum and millets. Journal of Cereal Science. – 2006. №3. P. 252-271.*
15. *Hale G.A., Abscher C.W., Totusek R., Tillman A.D. Net energy of sorghum grain and corn for fattening cattle. – J.Anim.Sci., 1968. v. 27. № 1. P. 165-169.*