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PRESERVING OF VIRGINIA FANPETALS (*SIDA HERMAPHRODITA*) BIOMASS PRODUCED IN VARIOUS TERMS OF HARVESTING CYCLE

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Abstract: *The research aimed at comparison of preserving and storing capacities for fanpetal-derived biomass harvested at various terms and after having been fertilized with a variety of preservative additives.*

For the research purposes, the fanpetal-derived biomass obtained from three harvesting terms and three fertilization procedures (1 – no fertilization; 2 – half of fertilization dose; 3 – full fertilization dose) was put under consideration. Two-stage harvesting cycle was performed: 09.06.2011 – the first harvest (3 types of biomass in relation to the fertilization system: 1/I harvest; 2/I harvest; 3/I harvest), 08.09.2011 – the second harvest (3 types of biomass in relation to the fertilization procedure: 1/II harvest; 2/II harvest; 3/II harvest). Single-stage harvesting cycle was performed: 14.09.2011 (3 types of biomass in relation to the fertilization procedure: 1/single-stage harvest; 2/ single-stage harvest; 3/ single-stage harvest). Each of the fanpetal-based biomass was preserved: additive-free and including formic acid, bacteria-based inoculation agent and enzymatic preparation. The fanpetal-based biomass proved to be hard to be preserved. In the case of all the types of preserved biomass, the acidification degree was proven to be unsatisfactory, lactic acid content was too low, the content of acetic and butyric acid was high, which is indicative of limited fermentation process. In the case of the fanpetal-derived silages under consideration, the content of dry matter and organic matter was reduced in comparison to all the kinds of green biomass undergoing silage process. The harvesting system and fertilization had the impact upon the size of losses of dry matter and organic matter in the course of storing the fanpetal biomass. Among the additives that were applied, only the enzymatic preparation had the positive impact upon the fermentation profile for all the types of the fanpetal-based biomass undergoing silage process.

Introduction

The growing demand for biomass from the power engineering industry calls for the need to establish dedicated crop plantation characteristic of high yield potential. Virginia Fanpetal, as perennial plant species of high yield potential has ed much interest from agriculture-related power engineering. On the grounds · existing research output, it is plausible to state that its biomass can be rated in the form of chips and can be used for production of briquette and ; (Borkowska and Styk 1997). Stems of Virginia fanpetal are most useful for ration purposes and its leaves could be used for production of biogas, 'er, there is no precise research output in that respect (Borkowska and Styk Using fanpetal-derived biomass for these purposes will call for preserving ›ring of this feedstock.

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The research aimed at comparison of preserving and storing capacities for al-derived biomass harvested at various terms and after having been ed with a variety of preservative additives.

ials and Methods

For the research purposes, the fanpetal-derived biomass obtained from ıarvesting terms and three fertilization procedures (1 – no fertilization; 2 – ˙ fertilization dose; 3 – full fertilization dose) was put under consideration. age harvesting cycle was performed: 09.06.2011 – the first harvest (3 types mass in relation to the fertilization system: 1/I harvest; 2/I harvest; vest), 08.09.2011 – the second harvest (3 types of biomass in relation to the ation procedure: 1/II harvest; 2/II harvest; 3/II harvest). Single-stage ing cycle was performed: 14.09.2011 (3 types of biomass in relation to the ation procedure: 1/single-stage harvest; 2/ single-stage harvest; 3/ single-arvest). Each of the fanpetal-based biomass was preserved in micro-silos ıf acid-resistant steel of 3 l in cubic capacity, in four options: additive-free cluding preservatives of various properties (formic acid – fermentation ır, bacteria-based inoculation agent 1x 10^9jtk/g *Lactobacilllus plantarum, ıcillus brevis, Lactobiacillus buchnerii* – fermentation stimulator and ıtic preparation containing cellulose and hemycellulose).

After 120 days of storing of fanpetal-derived biomass, the basic chemical ition was defined by means of standard methods (AOAC 2005): dry matter, sh, crude protein. In addition, pH of silage was defined by means of HI ⊣ meter and acid content was defined as far as acetic acid, butyric acid are ıed; methylacetic acid content was defined by means of gas tographic method using the apparatus (type 6890) with the flame ionization · (FID), lactic acid and ethyl alcohol content was defined by means of nethod.

In the fanpetal-derived silage the content of dry matter, organic matter was in comparison to all the types of green biomass undergoing silage process l). The harvesting and fertilization system had the impact upon the size of

losses of dry matter and organic matter during the period of storing fanpetal-derived biomass. Losses of dry matter were the lowest in the case of silage process of biomass obtained from 2nd harvest, whereas the largest reduction of dry matter content was reported in the course of storing biomass obtained from 1st harvest of fanpetal. The largest content of organic matter was maintained in the course of storing biomass obtained from the single-stage harvesting. Fertilization caused the content of dry matter and organic matter in silage of fanpetal obtained from 1st harvest to be reduced and affected the fermentation process of this type of biomass stored free of additives. It was characteristic of higher percentage share of acetic acid and butyric acid and lower acidification. All of the fanpetal biomass-based silage was characteristic of comparatively high pH that arose from insufficient content of soluble sugars in the green biomass. The harvesting system of fanpetal influenced the fermentation process of the stored biomass. Silage obtained from the 1st harvest was characteristic of higher content of fermentation products and more beneficial profile of acids (higher percentage share of lactic acid and lower percentage share of volatile acids). The lowest acidification and the worst profile of fermentation occurred in the case of silage obtained from the biomass produced from the single-stage harvesting.

Table 1.

Basic Chemical Composition of Fanpetal-derived Biomass
After 120 Days of Storing on the Additive-free Basis (% of Dry Matter)

Item	DM	OM	CP	pH	LA	AA	BA
1/I	14.08	85.28	13.39	5.11	51.1	22.1	17.3
2/I	11.46	82.43	15.06	5.23	45.1	11.6	36.3
3/I	11.59	82.97	14.99	5.66	34.6	43.2	23.8
1/II	19.11	85.76	9.48	4.98	32.8	21.1	12.7
2/II	20.56	88.00	8.96	5.1	45.6	31.4	25.6
3/II	16.69	86.10	11.04	5.43	22.6	23.7	32.9
1/s	26.40	91.35	5.48	5.55	32.7	16.8	34.7
2/s	25.37	90.68	6.47	5.67	12.8	19.8	21.6
3/s	24.09	89.59	6.80	5.7	13.9	21.5	25.4

DM = Dry Matter; OM = Organic Matter; CP = Crude Protein; LA = Lactic Acid; AA = Acetic Acid; BA = Butyric Acid

Addition of formic acid had a positive impact upon the content of dry · in comparison to the test silage. It was recorded in the case of the silage is of the biomass obtained from the single-stage harvesting of the fanpetal deprived of fertilization or fertilized with half of doses (Table 2). This ve, however, did not have any impact upon the content of dry matter in the obtained from the fanpetal fertilized with full doses regardless of the iting system. All of the silage with the additive of formic acid was teristic of lower pH in comparison to the silage without this additive. Formic mited lactic acid and butyric acid-related fermentation in the case of all the

Table 2.

Basic Chemical Composition of Silage of Various Types inpetal-based Biomass with the Additive of Formic Acid (% of Dry Matter)

	DM	OM	CP	pH	LA	AA	BA
	12.24	8474	13.95	4.44	41.1	23.1	12.2
	12.87	83.65	15.97	4.27	31.4	34.5	18.8
	11.39	81.05	15.38	4.67	43.8	21.1	18.9
	24.80	89.07	9.13	5.12	21.6	23.6	11.9
	19.94	87.89	8.41	5.23	34.7	32.2	22.6
	16.09	85.51	11.32	5.13	16.8	22.8	5.6
	29.98	92.51	4.75	5.17	24.6	21.7	12.9
	28.23	92.54	5.24	5.23	14.6	22.8	17.5
	24.68	89.89	6.18	5.45	16.8	18.6	20.5

ry Matter; OM = Organic Matter; CP = Crude Protein; LA = Lactic Acid; AA = Acetic Acid; ityric Acid

Majority of silages with the additive of bacteria-based inoculation agent aracteristic of similar content of dry matter and organic matter as compared test silages (Table 3). Bacteria-based inoculation improved acidification and fermentation process profile for the silage obtained from the 1st . The silage obtained from the 2nd harvest of fanpetal and the single-stage ing of fanpetal was characteristic of higher content if dry matter did not ny impact upon pH and fermentation profile in comparison to the silage free tives.

Table 3.

Basic Chemical Composition of Silage Derived from Various Types of Fanpetal-derived Biomass with Addition of Inoculation Agent (% of Dry Mattter)

Item	DM	OM	CP	pH	LA	AA	BA
1/I	12.26	84.16	14.35	4.91	45.8	10.11	10.6
2/I	12.31	81.61	14.16	4.8	47.7	10.3	21.8
3/I	12.62	82.87	16.64	4.91	21.6	12.7	23.1
1/II	19.61	85.21	10.80	4.89	32.5	12.7	32.3
2/II	21.04	88.04	9.01	5.4	44.7	23.5	18.8
3/II	16.33	86.80	11.65	5.29	21.5	18.9	12.9
1/s	26.82	91.36	5.37	5.61	21.8	12.8	25.8
2/s	25.98	90.34	6.39	5.88	13.8	33.4	22.7
3/s	26.33	89.26	6.25	5.72	12.2	28.8	19.1

DM = Dry Matter; OM = Organic Matter; CP = Crude Protein; LA = Lactic Acid; AA = Acetic Acid; BA = Butyric Acid

Application of the enzymatic additive had a positive impact upon the content of dry matter in the silage obtained from the sources containing higher content of dry matter (biomass obtained from the single-stage harvesting) (Table 4). In the case of all the types of silages, enzymatic additive improved fermentation profile and acidification. This may be indicative of larger supply of substrates for fermentation purposes, although no increase in the content of soluble sugars was reported (Table 8) in comparison to the test silages.

Table 4.

Basic Chemical Composition of Silage derived from Fanpetal-based Biomas with Enzyme-based Additive (% of Dry Matter)

Item	DM	OM	CP	pH	LA	AA	BA
1/I	10.75	80.54	14.73	4.61	82.1	16.8	7.8
2/I	10.80	79.20	14.70	4.8	77.2	5.4	24.7

12. 1	83.03	18.43	4.55	45.8	19.8	2.7
17.77	87.62	9.66	4.67	52.8	10.7	6.9
19.18	88.25	8.17	4.87	43.5	22.9	11.8
17.48	87.21	11.69	5.03	33.7	21.9	11.8
27.45	91.39	4.63	5.18	33.8	22.8	12.8
27.01	91.75	5.79	5.11	34.8	19.8	11.7
25.43	91.38	5.67	5.25	24.5	15.4	8.8

Dry Matter; OM = Organic Matter; CP = Crude Proteins; LA = Lactic Acid; AA = Acetic
·A = Butyric Acid

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