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Sorghum used to fodder production in dry farming

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ABSTRACT: In Italy water deficient increase forward to cultivate resistant crops for forage production. In the present research it has been studied the opportunity of using 2 varieties of sorghum: the "Sweet Creek", used as green forage and for silage and the "True", with thinner stalks, used as hay. The fodder production and the dhurrin content during the vegetative phase of the 2 varieties were recorded. Production and chemical characteristics of green and preserved fodders (hay and silage) were determined; moreover the nutritive value and the *in vitro* digestibility of DM were measured. Results confirm the good adaptation of the sorghum to the water limited conditions as those ones in which the test has been carried out; green and preserved fodders yield were high, however during the hay harvest problems due to the different drying dynamics of leaves and stalks were found. The dhurrin content of these two varieties, even in the young phase, allows the use for grazing of the regrown, which have good bunching.

Key words: Sorghum variety, Dry farming, Fodder production, Dhurrin content.

INTRODUCTION - The Enea report "Climate evolution and impacts of the climatic changes" (Ferrara V., 2003) bring out that the drought phenomena are increasing in Italy: heavy rainfalls are concentrated in the same period of high temperatures. These phenomena are furthermore destined to become even more important in the future because of Mediterranean climate tropicalization. So soil dryness will bring on negative effects on the agriculture; on details fodder reduction could cause great damages in the zootechnical field, so as already happened in 2003. Difficulties related to the fodder availability increase in the organic farms, because the law restricts the using of fodder produced out of the same farm. The utilization of tropical dryresistent fodder species can represent a solution to this problem (Grossi N. *et al.*, 1998). In this trial the opportunity of using two sorghum varieties was studied in order to produce green fodder and to preserve it in dry climate zones. It has been furthermore checked the opportunity of sorghum preservation not only with the ensilage technique, but also with hay harvest which is the moisture preservation method in small or medium stock-farms. Finally, the dhurrin content during vegetative phases in two sorghum varieties was controlled in order to evaluate the opportunity of using the vegetative regrown to graze.

MATERIAL AND METHODS - The research was carried out in a field of about 12 ha cultivated with two sorghum varieties: the "Sweet Creek", suitable as green fodder and ensilage and the "True", for the hay harvest characterized by a thin stalk. Both varieties were seeded on the 25 of May, after an organic fertilization, without using of irrigation, chemical fertilization, and herbicide use (organic cultivation). Along all the trial the thermo-pluviometric trend has been checked and the drought phases have been determined according to Walter and Lieth climate diagram (1960). The productive trend has been controlled from 15 June until 7 September, by samples cutting weekly on the three experimental plots for both variety. On the green samples of the two sorghum varieties the dhurrin content trend along the whole trial (also after the 1st cut of True variety) was controlled according to sodium picrate method (Gilchrist D.G. *et al.*, 1967). The "True" variety, as hay harvest, has been cut down (the 1st cut on 27 July and the 2nd on 17 September) at the flower buttons phase. During the 1st hay harvest the leaves and stalks drying dynamics have been evaluated separately; the stalks also after press conditioning. Furthermore Dry Matter percentage at pre-established intervals was recognized: 0, 1, 3, 6, 24, 48 and 72 hours after the cut. The "Sweet Creek" variety has been cut down at the milk-stage growing phase, ready to be ensilaged. The chemical composition of green and pre-

served fodder samples has been established according to Weende and Van Soest methods (Martillotti *et al.*, 1987); the Nutritive Value (Milk FU) have been calculated according to the equation of Antongiovanni (1993). Dry Matter, Organic Matter and NDF *in vitro* true digestibility (IVTD) of the green and preserved fodder (1st and 2nd hay cut and silage) have been evaluated according to Ankom Daisy method (Ankom methods, 2006); analysis were carried out with fresh ovine ruminal fluid, buffered at pH 6.8 and incubated for 48 hours at 39°C.

RESULTS AND CONCLUSIONS – During the experimental period the climatic trend permitted to reach the suggested targets, because after a short rain after the sowing there wasn't any rain during the vegetative and the harvest phases (Figure 1). So that the trial was carried out in the expected drought conditions; the two sorghum varieties developed without any problem and reached a maximum height of two meters. The productive trend was steadily growing with productions of green fodder near to 10 t DM/ha (Figure 2). Two hay-cuts of the "True" sorghum variety were made in Summer, allowing a total hay production of 8.08 t DM/ha, while the "Sweet Creek" sorghum variety was cut on 13 of September with a silage production of 8.42 t DM/ha. The "True" sorghum variety didn't result very good for hay conservation because of different characteristics of the leaves and of the stalks. Leaves are thinner and have a quick drying process reaching the better moisture of harvest (<20%) after 20 hours from the cut. Stalks are thicker and wrapped by a leaf sheath covered by the cutin, so that couldn't reach the 20% of moisture even after 72 hours from the cut. Satisfying results weren't obtained even with press-conditioning systems (Figure 3), because the leaf sheath wrapping the stalks is elastic and not permeable and limited the water evaporation during the sun exposure. The hay and the silage show similar nutritional characteristics with good digestibility values, both for DM and OM, but they had lower NDF then the green forage (Table 1).

Figure 1. Climate diagram.

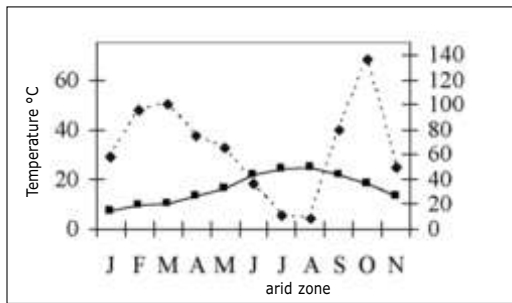
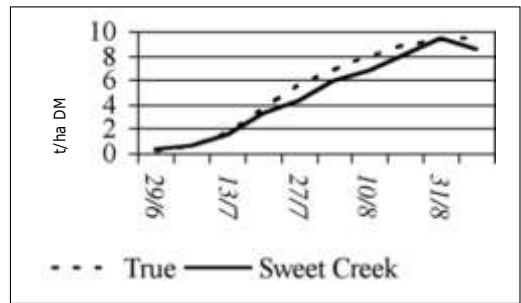


Figure 2. Fodder production outline.



Their chemical characteristics were quite near to the green corresponding forage, because the last presented low conservation losses in both the techniques. However the hay, because of the drying difficulties of the stalks, which are about the 50% of the total biomass, showed an excessive moisture percentage; compromising hay conservation so that hay should be used in a short time. Dhurrin content of the varieties was always under the toxicity threshold. Two varieties showed a similar trend during the trial with a quick decrease at the beginning and very low values in the more advanced vegetative phases (Figure 4).

Figure 3. Sorghum drying kinetic.

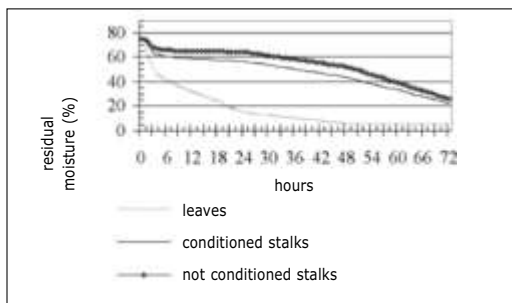
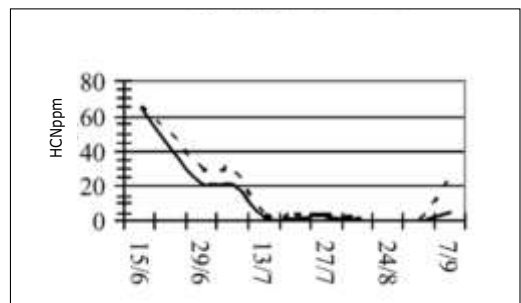


Figure 4. Dhurrin content.



Contrary to what observed in a preceding trial on the same subject, the hydric stress did not increase the dhurrin content in these two varieties (Pistoia *et al.*, 2003). These two sorghum varieties showed a good adaptation to the drought conditions occurred during the trial. Sorghum can be sown later, when there are low fodder productions in Spring, so this crop can be used as emergency fodder to produce green forage in Summer and to make a Winter stock. The dhurrin content of these two varieties, even in the young phases, permits the use for grazing of the regrown, which have good bunching. Production and quality of preserved fodder (hay and silage) were similar, but sorghum characteristics, water stress resisting once, cause some problems in the hay harvest due to the slow evaporation of water from the stalks even if they are press conditioned.

Table 1. Proximate analysis, NV and in vitro true digestibility (IVTD) of DM, OM and NDF.

		Sorghum True Fresh Fodder	Sorghum True Hay	Sorghum Sweet Creek Fresh Fodder	Sorghum Sweet Creek Silage
Dry Matter	%	27.10	82.53	25.12	37.07
Protein	%DM	9.39	8.10	9.28	8.09
Crude Fibre	"	28.51	30.78	26.53	29.13
Ether Extract	"	2.22	1.97	2.14	3.11
Ashes	"	6.50	6.39	7.89	8.48
N-free Extract	"	53.38	52.76	54.16	51.19
NDF	"	63.27	62.55	62.59	60.12
ADF	"	31.74	33.81	31.32	34.50
ADL	"	5.54	5.66	5.17	5.54
AIA	"	1.41	1.65	1.68	1.19
Hemicellulose	"	31.52	28.74	31.27	25.62
Cellulose	"	24.79	26.50	24.47	27.77
Milk FU	KgDM	0.82	0.78	0.81	0.77
IVTD DM	%	73.56	69.83	75.59	67.30
IVTD OM	"	73.96	70.22	75.93	68.40
IVTD NDF	"	49.32	47.42	49.67	47.99

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