CHEMICAL COMPOSITION AND FEED VALUE FOR RUMINANTS OF WEEDY MAIZE SILAGE

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Summary. Nutritive value of maize silage comprises the existent nutritive elements in the dry matter of fodder. However, there are many weed plants in ensiled green mass of maize *Zea mays*. Weeds can affect the value and digestibility of silage and can have toxic elements. That can influence the productivity of cattle and the quality of their products.

The field and laboratorial experiments were carried out at the Lithuanian University of Agriculture. The silage was made from non-weedy maize; from weedy maize where these weed species dominated: white goosefoot *Chenopodium album*, field pennycress *Thlaspi arvense*, scentless mayweed *Tripleurospermum inodora* and shepherd's purse *Capsella bursa-pastoris*; and from maize crop with noxious plant black nightshade *Solanum nigrum*. The chemical composition, digestibility and feed value were established using Wender's fodder analysis and Hohenheim test of fodder value. Potential usage of three kinds of maize silage were investigated. Weeds decreased energetic value of maize silage but increased the amount of crude protein by 10% and of mineral elements of 50%. The amount of crude protein was 15% bigger in maize silage with 10% of black nightshade than in non-weedy silage, but it did not influence positively the energetic value of fodder.

Keywords: maize silage, chemical composition, digestibility, ruminants, weed plants

PIKTŽOLĖTŲ KUKURŪZŲ PASĖLIO SILOSO PAŠARINĖ VERTĖ IR ĮTAKA GALVIJŲ VIRŠKINIMUI

Santrauka. Kukurūzų *Zea mays* pasėlio siloso maistinę vertę sudaro pašaro sausojoje masėje esančios maisto medžiagos. Tačiau, silosuojamoje žaliojoje kukurūzų masėje dažnai randama daug piktžolių. Piktžolės įtakoja pašarinę siloso vertę ir virškinamumą. Kartais į pašarus patenka ir nuodingųjų medžiagų turinčios piktžolės, kurios gali neigiamai paveikti galvijų produktyvumą ir produkcijos kokybę.

Laboratoriniai ir lauko tyrimai atlikti Lietuvos žemės ūkio universitete. Analizuojamas silosas buvo pagamintas iš nepiktžolėtų, ir piktžolėtų kukurūzų pasėlio kuriame dominavo baltoji balanda *Chenopodium album*, dirvinė čiužutė *Thlaspi arvense*, bekvapis šunramunis *Tripleurospermum inodora* ir trikertė žvaginė *Capsella bursa-pastoris*, ir kukurūzų pasėlio su išplitusia nuodingąja piktžole – juodąja kiauliauoge *Solanum nigrum*. Laboratotinėmis analizėmis nustatyta šių trijų kukurūzų siloso rūšių cheminė sudėtis, virškinamumas ir potencialios naudojimo galimybės.

Raktažodžiai: Kukurūzų silosas, cheminė sudėtis, virškinamumas, piktžolės.

Introduction. Maize (Zea mays) has a big value for human as a nutritional, fodder and technical agricultural plant. Grain and ensiled plants are used for concentrated fodder together with cobs in milk-dough stage of maturity (Bagdonaitė et al., 1963). Maize silage is widely made in Lithuania for feeding cattle, but the optimal stage of maturity is often not chosen for fodder ensiling, so much fodder energy is lost (Mikulionienė, 2001). Silage fodder value of maize, as well as of other agricultural plants, depends not only on optimal time of harvesting, but also on botanical composition of the crop. Agricultural plants grow in the crop together with wild plants – weeds. A part of them have a good fodder value, are eaten by cattle and do not decrease fodder value, but a part of weeds have a low fodder value, and some of their species are noxious. Cattle cannot be fed on fodder with a bigger amount of noxious weeds.

The aim of the research: to establish chemical composition of different kinds of maize silage, digestibility and fodder value depending on crop botanical composition.

Materials and methods. Field and laboratorial trials were carried out in 2001. Maize *Zea mays* hybrid "Ulla" and weeds were received from the research station of Lithuanian University of Agriculture and maize with noxious black nightshade *Solanum nigrum* from maize crop in Mastaičiai, Kaunas district. Weedness was established using a frame of 50x50 cm and samples were taken with 4 replications. Collected weeds were air-dried, weighed, counted and divided according to species composition.

Green mass of maize was ensiled at Lithuanian University of Agriculture. Joint laboratory "Tempus" of agronomical and zootechnical analyses in glass hermetically closed dishes. The silage was prepared from maize of dough stage of maturity without the additives. Chemical composition of fodder – the amount of moisture, crude protein, crude fat, crude fibre, crude

ashes, β-carotine, starch and metabolizable energy, netto energy for lactation (NEL MJ/kg-dry matter), and digestibility *in vitro* (Hohenheim test of fodder value) were established using Wender's fodder analysis (Nauman, Bassler, 1993). The amount of NEL is counted after establishing the amounts of crude protein, crude fat and crude fibre g/kg in dry matter of fodder (Nauman, Bassler, 1988). These methods are confirmed by German union of agricultural scientific trials and are officially recognised by the Commission of European Union. The quality of laboratorial trials data was established on the basis of the differences between trial parallels depending on concentration of found matters in analysed samples. The results of analyses were statistically reliable at 95% of probability level according to permitted range of errors between the parallels.

Results. Four maize plants grew in one square metre of maize crop, and an average dry mass of one plant made 137.6 g. There were 14 weed species established in maize crop: common chickweed *Stellaria media*, white goosefoot *Chenopodium album*, field pennycress *Thlaspi arvense*, shepherd's purse *Capsella bursa-pastoris*, scentless mayweed *Tripleurospermum inodora*, black bindweed *Fallopia convolvulus*, treacle mustard *Erysimum cheiranthoides*, wild mustard *Sinapis arvensis*, quack-grass *Elytrigia repens*, field sowthistle *Sonchus arvensis*, red clover *Trifolium pratense*, wild pansy *Viola tricolor*, greater meadow *Phleum pratense* and suffolk-grass *Poa annua*. The 4 weed species dominated there: white goosefoot 41 weeds/m^2 and 25.3 g/m^2 of air-dried mass, field pennycress 20 weeds/m^2 and 19.3 g/m^2, scentless mayweed 27 weeds/m^2 and 17.3 g/m^2 and shepherd's purse 10 weeds/m^2 and 5.3 g/m^2. Dominating weed species made 77.2% and 82.7% of general weed number and air-dried mass, respectively.

Chemical composition of analysed maize silage is presented in Table 1. Chemical composition, fodder and energetic value of non-weedy maize silage coincide with the requirements of good quality silage (Table 1, Fig. 1 and 2). Weedy maize silage had 1% and maize silage with 10% of black nightshade – 3% less of dry matter than non-weedy silage (Fig. 1). Depending on weeds, the amounts of crude ashes increased nearly twice, crude proteins - 9 g/kg and crude fibre 3g/kg comparing with non-weedy silage (Table 1). Weeds decreased energetic value of silage (Fig. 2). Digestibility of weedy silage organic mass was analogical as of non-weedy silage, but digestibility of organic mass of maize silage with black nightshade was 1% lower (Fig. 2).

Table 1. **Chemical composition of maize silage**

Maize silage	g/kg DM					β-carotine, mg/kg	NEM, g/kg DM
	CP	CFi	CF	CA	S		
non-weedy	78	190	33	42	320	10	657
weedy	87	193	32.5	75	305	50	612.5
with 10% of black nightshade	92	195	34.7	62.8	311	50	615.5

DM – dry matter; CP – crude protein, g/kg DM; CFi – crude fibre, g/kg DM; CF – crude fat, g/kg DM; CA – crude ashes, g/kg DM; S – starch, g/kg DM; NEM – non-nitrogen extracted matters, g/kg DM.

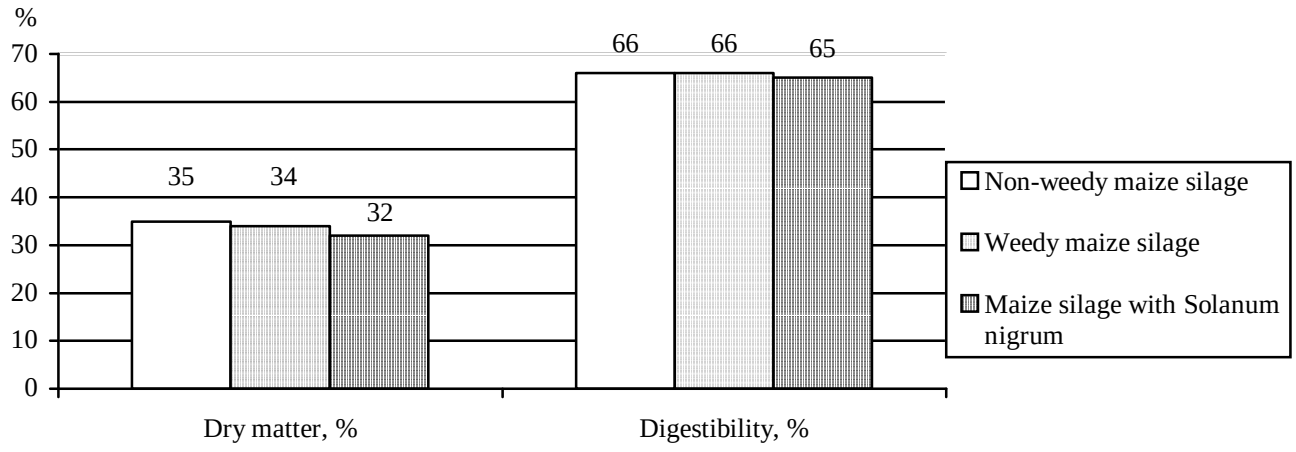

Figure 1. **Amount of maize silage dry matter [%] and digestibility of organic mass [%]**

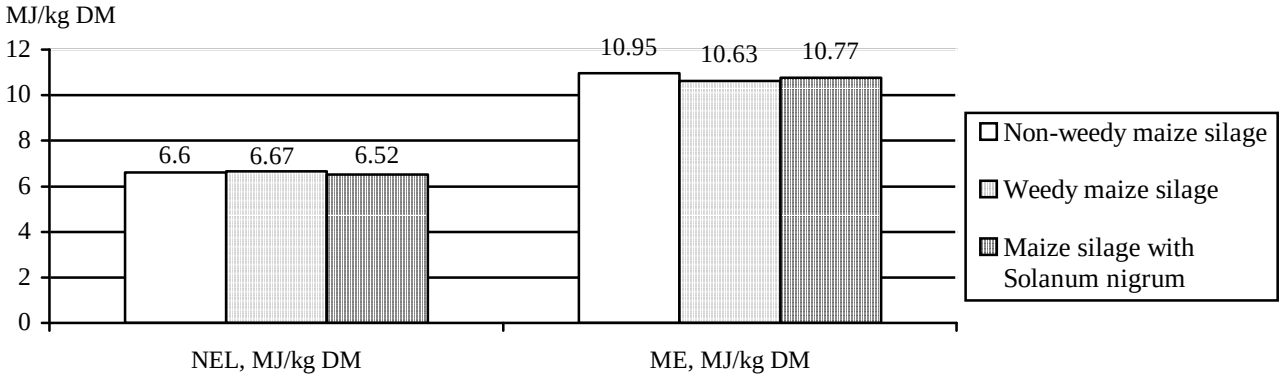

Figure 2. **Metabolizable energy of maize silage [ME MJ/kg DM] and netto energy for lactation [NEL MJ/kg DM]**

Discussion and Conclusions. Investigated maize silage coincides with the requirements of high quality for silage according to chemical composition, digestibility and energetic value. Dominating weed species in maize crop - white goosefoot, field pennycress, scentless mayweed and shepherd's purse – grow in all areas of Lithuania (Galinis et al., 1980; Aleksandravičiūtė et al., 1961). Scentless mayweed grows up to 80 cm high (Galinis et al., 1980), field pennycress up to 50 cm (Aleksandravičiūtė et al., 1961), shepherd's purse up to 60 cm (Aleksandravičiūtė et al., 1961), and white goosefoot up to 150 cm (Aleksandravičiūtė et al., 1961). These weeds are high or middle high. Black nightshade is a bit lower weed that grows up to 40 cm high (Butkus et al, 1976), but it gets into silage even when height of maize cutting is increased. Cattle eat field pennycress, but a big amount of it can be noxious for them; shepherd's purse is good fodder for small animals; white goosefoot fits not only for cattle fodder but also for human food (Aleksandravičiūtė et al., 1961), and scentless mayweed is almost not eaten by cattle (Galinis et al., 1980). Less than 1.1% DM gliucoalcaloids (solanin) is found in the leaves of black nightshade. Cattle get poisoned rarely, but there were cases of mass poisoning abroad (Orlova et al., 1990; Butkus, Lapienis, Palčiauskas, 1987) and in Lithuania (Butkus, Lapienis, Palčiauskas, 1987) feeding cattle on fodder, which had up to 35% of black nightshade. Ensiling the amount of solanin decreased, but silage can remain poisonous (Butkus, Lapienis, Palčiauskas, 1987). So, leguminous grass and weeds in maize green mass influence the value of fodder. Weeds enrich maize green mass with crude protein, mineral matters and vitamins (Jeroch, Drochner, Simon, 1999).

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