

# MISCANTHUS CULTIVATION IN ROCKS WITH DIFFERENT GEOLOGICAL AGE

**Mykola Kharytonov<sup>1</sup>, Mykhaylo Babenko<sup>1</sup>, Nadiia Martynova<sup>2</sup>, Mykhaylo Gumentyk<sup>3</sup> and Valery Katelevsky<sup>3</sup>**

<sup>1</sup>*Dnipropetrovsk State Agrarian and Economics University, Ukraine*

<sup>2</sup>*Oles Honchar Dniprovsky National University, Ukraine*

<sup>3</sup>*Institute of Energy Crops and Sugar Beet, Kiev, Ukraine*

Recently, more and more scientists give to *Miscanthus* the leading part on supplying cellulose-rich feedstock for energy production and the chemical industry. In particular the *Miscanthus* biomass can be used as animal litter, biomaterial, or bioplastic.

During two years (2016–2017), an integrated study to identify the effect of different types of polymineral rocks and their mixtures on biometric parameters and the biomass of *Miscanthus × giganteus* was conducted. The research was carried out at Pokrov land reclamation station of Dnipropetrovsk State Agrarian and Economic University.

This site is located in the Dnipropetrovsk region in the steppe zone of Ukraine with moderately continental climate. Pokrov land reclamation station is located in the Nikopol manganese ore basin. The rocks of this ore basin are presented the holocene, postpliocene, neogen and paleogen deposits. These mining rocks are brought to the surface during manganese ore mining. The soil mass is taken off, piled up and heaped onto the land after the rock has been replaced.

Two experiment variants were established. In both variants the rhizomes of *Miscanthus × giganteus* were planted in lysimetric containers. In the first case, eight different models of rock substrata were used: 1) loess-like loam (LLL), taken from the board of the quarry (0–150cm); 2) a rocks mix (RM), which consists of loess-like loam and red-brown clay taken from the board of the quarry (0–150 cm); 3) red-brown clay (RBC) taken from the board of the quarry (0–150 cm); 4) green-grey clay (GGC) taken from the board of the quarry (0–150 cm); 5) black soil (BS) 0–50 cm + green-grey clay (50–150 cm); 6) black soil (0–50 cm) + red-brown clay (50–150 cm); 7) black soil (0–50 cm) + loess-like loam (50–150 cm); 8) black soil (0–150 cm).

The data obtained during the first experiment variant showed that the type of rock substrate affects biometric values. So, in the first year of growing, the difference in plant height between the models was up to 33 cm. The lowest values were noted in the variant with made layer of black soil (130 cm). In the second year of cultivation, this ratio has changed. The highest height was recorded for plants grown on red-brown clay with the addition of black soil (172.5 cm), and the smallest in the variant with green-grey clay (150.8 cm). It was shown that plants are added in growth from 2–3% (models BS+GGC and TM) to 20–30% (models BS+ LLL, BS and BS+ RBC) with age.

In the first year of cultivation, the *Miscanthus* plants form an average 8–13 monocarpic shoots per clump, depending on the type of rock substrate on which they grow. During the second growing season, the intensity of clump expansion was 70–120%. As a result, the stem number per 2-year-old plants ranged from 15 to 30 tillers.

The diameter of a monocarpic shoot depends little on the age of the plant, but environmental factors can influence its value. Here this indicator varied from 6.9 mm to 9.4 mm, depending on the rock substrate type on which the studied plants grew. The thickest strong shoots of *Miscanthus* develop on rocks mixture and on loess-like loam, and the weak ones on green-grey clay.

To determine the dry biomass yield (DM) of *Miscanthus*, the average weight of one plant was calculated. The conversion of yield per unit area was carried out from the calculation of the planting density (about 14,800 plants per ha). Thus, the yield of plants in the first year of cultivation was from 3.27 to 6.78 t DM ha<sup>-1</sup>. The lowest productivity was shown by plants growing on green-grey clay; the greatest yield was recorded in specimens grown on loess-like loam. By the end of the second year the yield increased from 42.0 to 87.9%. The best result was shown by plants on loess-like loam and rocks mix.

**Key words:** Manganese Ore Mining, Rock Substrate, Melioration, *Miscanthus giganteus*