by 0.559 and 0.490 mg/kg of dry soil, or 42.8 and 37.6%, with a significant difference to the control $p < 0.001$. Through the development and implementation of various systems of fertilizer combined with liming soil in specific soil and climate conditions can be reduced by 56-78% the accumulation of Cd$^{2+}$ ions in plants table beet and get environmentally safe products.

**References:**

1. Huraldchuk, Zh. Z. (2006). Phytotoxicity of heavy metals and plant resistance to their actions. Kyiv, 208 p.
2. Dydiv, A. (2017) Influence of fertilizers and ameliorants on the quality of beet root dining in case of soil contamination cadmium. *Scientific Herald of National University of Life and Environmental Sciences of Ukraine: agronomy*. №. 269. P. 234–24.
3. Fatieiev, A. I. & Samokhvalova, V. L. (2012). Detoxification of heavy metals in soil system: methodical recommendations. Kharkiv, 70 p.
4. Ridei, N. M., Strokal, V. P., Rybalko, Yu. V. (2011). *Environmental assessment of agrobiocenosis: theory, methodology, practice*. Kherson, 2011. 258 p.
5. Snytinsky, V. & Dydiv A. (2017). The mobility of cadmium and lead in soil and their impact on the quality of beetroot (*Beta vulgaris L.*) with different systems of fertilization. *Zeszyty Naukowe Uniwersytetu Przyrodniczego we Wrocławiu: seria rolnictwo*. CXXII (625). Str. 87–98.

**DOI 10.36074/13.03.2020.v1.19**

**UPDATED METHOD OF CHERRY CLONAL ROOTSTOCK VSL-2 PROPAGATION IN STOOLBED IN WESTERN UKRAINE**

**ORCID ID: 0000-0002-5915-9564**

**Bohdan Hulko**  
PhD in Horticulture, Associate professor  
*Lviv National Agrarian University*  
**UKRAINE**

Modern intensive cherry orchards should have low growth vigour, sufficient winter hardiness, be highly productive and very precociuos. It is possible to create such plantings, using a new promising types of clonal rootstocks. The most common cherry rootstocks in European countries are: Colt, F12/1, Mazard, PHL-A, Maxma Delbar [1].

The dwarfing rootstocks such as Gisela 5 and Gisela 6 are gaining popularity in the world. However, according to studies, they were not frost-resistant enought in some cases [4].

The disadvantages of clone rootstocks common in Western Europe are insufficient winter and drought tolerance, bacterial cancer (Colt), susceptibility to coccomycosis, poor adaptability to heavy soils (Santa Lucia, GF-64), insufficient drought tolerance. (Camille, Damille, Inmil) [4].

Significant successes in the breeding of new clonal rootstocks for cherries have been made in the Krymsk Research Station. Obtained rootstocks VC-13, LC-52,
VSL-2 are marked with winter hardiness, provide a growth vigour of grafted on them trees, do not form root shoots, propagate well [1].

The rapid introduction of such rootstocks into the production depends on the use of all technological means that can help to increase the amount of planting material.

The method of propagation of vertical and horizontal stoolbeds is widely used for the propagation of rootstocks worldwide. It is much cheaper than woody or green cuttings or micro-clonal propagation.

In the traditional way of propagation of clonal rootstocks, mother plants are hilled only by soil and the quality of the shoots and their root system often do not meet the requirements of the standards. The use of a substrate (peat, sawdust, sand, perlite) promotes more intensive rhizogenesis through the creation of more favorable air, water and temperature conditions in the root formation zone [3].

The important factor in improving the productivity of clonal rootstocks is the improvement and introduction of new elements to their cultivation technologies. In Ukraine, the most common method of propagation of clonal rootstocks is by vertical stoolbeds does not always achieve effective productivity of plantings. The horizontal way of stoolbeds production of the shoot-forming zone makes it possible to significantly increase the production rooted shoots [2].

According to P.V. Kondratenko data a horizontal method of stoolbeds, compared with vertical, provides a much more of standard rootstocks per hectare [2].

An important role for good root formation is played by the type of substrate for hilling. The best are: peat and sawdust mixture, which increases rootstock quality and productivity up to 20% [4].

| №  | Variant                                  | Rootstock height, cm | Rootstock diameter, mm | Root system length, cm | Root forming ability, points (0-5) | Lateral branches, points (0-3) | Formation of the top bud, points (0-5) |
|----|------------------------------------------|----------------------|------------------------|------------------------|-----------------------------------|---------------------------------|--------------------------------------|
| 1  | Soil hilling, no cutting (c)             | 134.4                | 10.7                   | 15.5                   | 3.3                               | 1.8                             | 5.0                                  |
| 2  | Sawdust hilling, cutting back at 5 cm    | 111.0                | 9.4                    | 16.2                   | 3.9                               | 1.0                             | 4.8                                  |
| 3  | Sawdust hilling, cutting back at 10 cm   | 111.0                | 9.2                    | 15.6                   | 3.8                               | 1.1                             | 4.8                                  |
| 4  | Sawdust hilling, cutting back at 15 cm   | 126.8                | 10.2                   | 16.6                   | 4.1                               | 1.6                             | 5.0                                  |

The trials on cutting back height of shoots and substrate treatment effect on rooted shoots of cherry rootstock VSL-2 productivity was made in stoolbed with horizontal method of propagation, established in 2009, spacing 1,5 x 0.3 m; 22 000 plants per hectare. The test plots were situated on the test field of HortDept of Lviv
NAU in condition of Western Ukraine on semi-clay light grey soil (pH=6.2), humus content in the soil layer of 0-40 cm - 1.79%. The area was not irrigated.

The study object was a horizontal stoolbed of clonal rootstock for cherry VSL-2. Research options were: cutting back shoots after growth start by: 5, 10 and 15 cm and hilling bushes with and without sawdust. As a standard was a traditional hilling with soil without shoots cutting back after growth start.

All measurements were done on the obtained rooted shoots (Table 1). The result showed that, on average, over three years of studies, rootstocks size was bigger in the control (134.4 cm). Smaller rootstocks - 111.0 cm were noted in variants after cutting back at 5 and 10 cm from the ground level.

| №   | Variant                                | Productivity of rooted shoots, thousands per hectare | % to control |
|-----|----------------------------------------|----------------------------------------------------|--------------|
| 1.  | Soil hilling, no cutting (c)           | 60.3, 73.7, 262.6, 132.3                            | 100.0        |
| 2.  | Sawdust hilling, cutting back at 5 cm  | 93.8, 120.6, 370.3, 194.9                           | 147.4        |
| 3.  | Sawdust hilling, cutting back at 10 cm | 73.7, 154.1, 329.9, 185.9                           | 140.6        |
| 4.  | Sawdust hilling, cutting back at 15 cm | 63.7, 93.8, 289.5, 149.0                           | 112.7        |

The diameter of the conditional rootstocks in all investigated cases met the requirements of the standard and were: 9.2-10.7 mm. The development of the root system and the degree of rooting of the rooted shoots was better than in control, in all investigated variants.

The data analysis of the Table 2 showed that the best productivity of standard rootstocks of VSL-2 in the stoolbed were obtained in the variant with shoots cutting back at a height of 5 cm with next sawdust hilling. An average productivity was 194.9 thousand per hectare. When the shoots were cutted back at a height of 10 cm, the amount of standard rootstocks was little less - 185.9 thousand per hectare, and after cutting back at a height of 15 cm – 149.0 thousand per hectare. In the control variant, without cutting back and sawdust, the amount of standard rootstocks was 132.3 thousand per hectare. So all investigated variants showed much better performance than control: with sawdust treatment and shoots cutting back at a height of 5 cm, the output of standard rootstocks was over control on 47.4%; at a height of cutting 10 cm – 40.6% over control; at a height of cutting 15 cm – 12.7% over control.

After this trial we have found that the better way to propagate cherry clonal rootstock VSL-2 in stoolbed with horizontal method is cutting back of shoots after their growth start at a height of 5 cm and use of sawdust as a substrate for hilling, which in the conditions of Lviv region provides an increase of the productivity of standard rooted shoots from one hectare by 47.4%, the total productivity of standard
rootsocks in this case rise up to 194.9 thousand per hectare.

References:
1. Ерёмин, Г.В., Проворченко, А.В. & Гавриш, В.Ф. (2001). Новые клоновые подвои для косточковых культур. Садоводство. К.: Нора-принт. Вып. №53., 157-160.
2. Кондратенко, П.В. & Книга, М.М. (1995). Ресурсозаощаджуючі технологічні підходи при створенні маточників горизонтального типу. Садоводство. К.: Нора-принт. Вип. №47.
3. Гулько, Б.И. & Оратівський, С.І. (2011). Способы розмножения клоновой підщепи для черешні ВСЛ-2 у маточниках різного типу в умовах західного Лісостепу України. Вісник Львівського НАУ: Агрономія №15, 404-409.
4. Кіщик, О.А. & Кіщик, Ю.П. (2008). Проблеми та перспективи вирощування кісточкових культур.Садівництво. К.: СПД «Жителєв С.І.» Вип. 60. С. 127 -137.

DOI 10.36074/13.03.2020.v1.20

ПРЕПАРАТИ ГЛІФОСАТУ В АГРОСФЕРІ УКРАЇНИ: ПРИХОВАНІ НЕБЕЗПЕКИ ТА ЇХ НАСЛІДКИ

Чонка Іванна Іванівна
канд. біол. наук, доцент кафедри екології та охорони навколишнього середовища хімічного факультету ДВНЗ «Ужгородський національний університет»

Останнім часом в Україні збільшилася кількість скарг населення на загальне погіршення стану здоров’я та алергічні реакції у зв’язку із обробкою полів пестицидами дистанційним способом. Бджолярі дедалі частіше відмічають масовий падіж комах-запилювачів, підтвердженою причиною якого є засоби хімічного захисту рослин. Вказані проблеми пов’язують із використанням аграріями препаратів гліфосату, які часто є нейкісними, простроченими та із невідомим складом. В Україні зареєстровано та дозволено використовувати близько 30 гербіцидних препаратів та десикантів на основі гліфосату, який вважається малотоксичним. Однак ряд вчених доводять, що допоміжні препарати – ад’юванти та прилипачі, які входять до складу комерційних пестицидів, – підсилюють дію основного компонента та є причиною токсичності гліфосатних отрутиохімікатів [1, 2]. Як ад’юванти застосовують сурфактанти (ПАР), регулятори твердості та кислотності води, очищувачі систем обприскувачів, антипінні присадки, неорганічні солі, в тому числі сполуки важких металів.
Тому, метою роботи було вивчення схеми застосування препаратів на основі гліфосату для вирощування сільськогосподарських культур в Україні, наслідків його використання та незалежні дослідження залишкового гліфосату і сполук важких металів у соняшниковій олії. Вміст гліфосату визначали методом тонкошарової хроматографії (МВ 3222-85) в олії дезодорованій.