E CONF SERIES

International Conference on Multidisciplinary Sciences and Educational Practices
Hosted online from Rome, Italy
Website: econfseries.com 27th March, 2025

ACCUMULATION OF CHROMIUM (CR) AND LEAD (PB) IN FRUIT TREES GROWN IN HEAVY METAL-POLLUTED AND ECOLOGICALLY CLEAN AREAS OF TASHKENT REGION

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Abstract:
The accumulation of heavy metals in the organs (leaves, branches, fruits, seeds) of fruit trees growing in areas of Tashkent region contaminated with heavy metals and ecologically clean areas was studied. According to the results of the study, the accumulation of lead and chromium in the organs of fruit trees follows the following decreasing sequence: leaf → stem → seed / grain →fruit.

Key words: Fruit tree, apple, apricot, peach, leaf, fruit, branch, seed, heavy metal, accumulation.

INTRODUCTION

Food safety is a major public concern worldwide. During the last decades, the increasing demand of food safety has stimulated research regarding the risk associated with consumption of foodstuffs contaminated by pesticides, heavy metals or toxins [2]. According to Zhuang et al. (2009)Arsenic (As), Cadmium (Cd),Mercury (Hg) and Lead (Pb) may inadvertently enter the food chain and pose health risks to humans [6].

Apples constitute a frequent component in the diet of the World population. They are readily eaten in large quantities due to their tasty properties and the mineral salts and vitamins present. That being so, apples should systematically and thoroughly undergo quality tests. Such tests should cover the content of heavy metals, in

particular lead, cadmium, arsenic and mercury. These elements may be the cause of serious deseases. Factors that may influence the content of trace elements in apples include the properties attributable to a particular variety of apples, air pollution, agro-technical treatment or specific soil characteristics [1, 5]. Agricultural regions usually feature smaller concentrations of these elements, compared to urbanized areas or areas located in the vicinity of industrial plants [7].

Plants usually accumulate larger quantities of metals in their leaves than in their fruits or seeds. On the other hand, some studies have shown that heavy metals significantly contaminate the fruit [3, 4].

MATERIALS AND METHODS. The studies were conducted on fruit trees growing in Bekabad and Piskant districts of Tashkent region, contaminated with heavy metals due to industrial enterprises, and in the ecologically clean zone of Nanai village of Bostanlyk district. Heavy metals in fruit trees were determined using laboratory equipment “Optical emission spectrometer AVIO-200” in terms of dry matter.

RESULTS AND DISCUSSION. Chromium bioaccumulation was detected in the peach variety “Champion” in the orchard of the “Erkin Ota Baglari” farm located in the Piskent district of the Tashkent region. Chromium accumulated in leaves at 0.82 mg/kg, in branchs at 0.50 mg/kg, in kernels at 0.41 mg/kg, and in fruits at 0.26 mg/kg. The chromium content in leaves and branchs of all fruit trees in the anthropogenically polluted and ecologically clean areas of the region under the influence of industrial facilities was up to 8 times higher than the MPC, and in seeds at 2 times higher.

The chromium content in the fruits of apple, pear, peach and plum varieties in orchards located in the Bekabad district and in the Nanai massif of the Bostanlyk district was below the MPC limit (Figure 1).

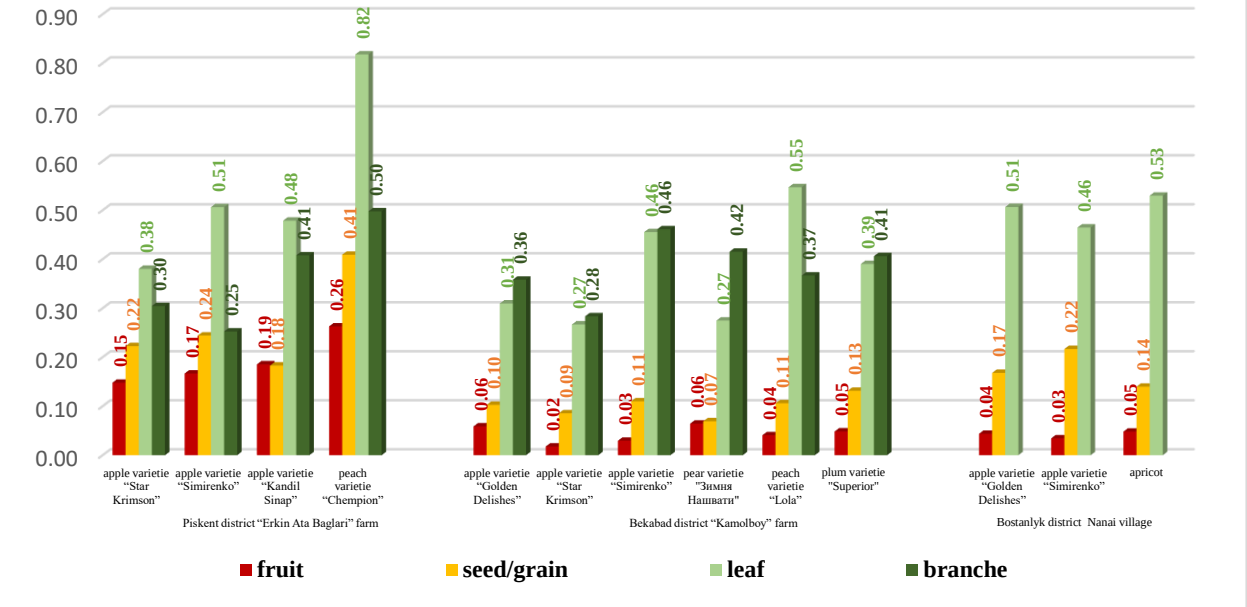

Figure 1. Bioaccumulation of chromium (Cr) in vegetative and generative organs of fruit trees, mg/kg dry matter (2021-2023)

The accumulation of lead in the organs of fruit trees grown in the Bostanlyk, Bekabad and Piskent districts of the Tashkent region was studied on a district-by-district basis. The accumulation of lead in the leaves and branchs of trees grown in the "Kamolboy" farm of the Bekabad district and the Nanai village of the Bostanlyk district was consistent with each other and was 1.5 times higher than the REM, while the trees grown in the "Erkin Ata Baglari" farm of the Piskent district accumulated a large amount of lead in the leaves and branchs. Peach leaves in Piskent district were found to contain 13.29 mg/kg or 33.23 times the MPC, twigs 8.99 mg/kg or 22.49 times the MPC, kernels 3.47 mg/kg or 8.68 times the MPC, and fruits 1.87 mg/kg or 4.68 times the MPC. among fruit tree species, the amount of lead in peach fruit was found to be several times higher than the MPC. Other fruits contained less than the MPC.

The leaves of the apple varieties "Star Krimson", "Simirenko" and "Kandil Sinap" from the orchard of the "Erkin Ota Boglari" farm in Piskent district accumulated 5.93-5.48-6.12 mg/kg of lead, or 14.83-13.69-15.39 times more than the MPC. The fruit and seeds of the apple accumulated lead in amounts lower than the MPC (Figure 2).

According to the results of the study, the accumulation of lead in the organs of fruit trees follows the following decreasing sequence: leaf → stem → seed / grain →fruit.

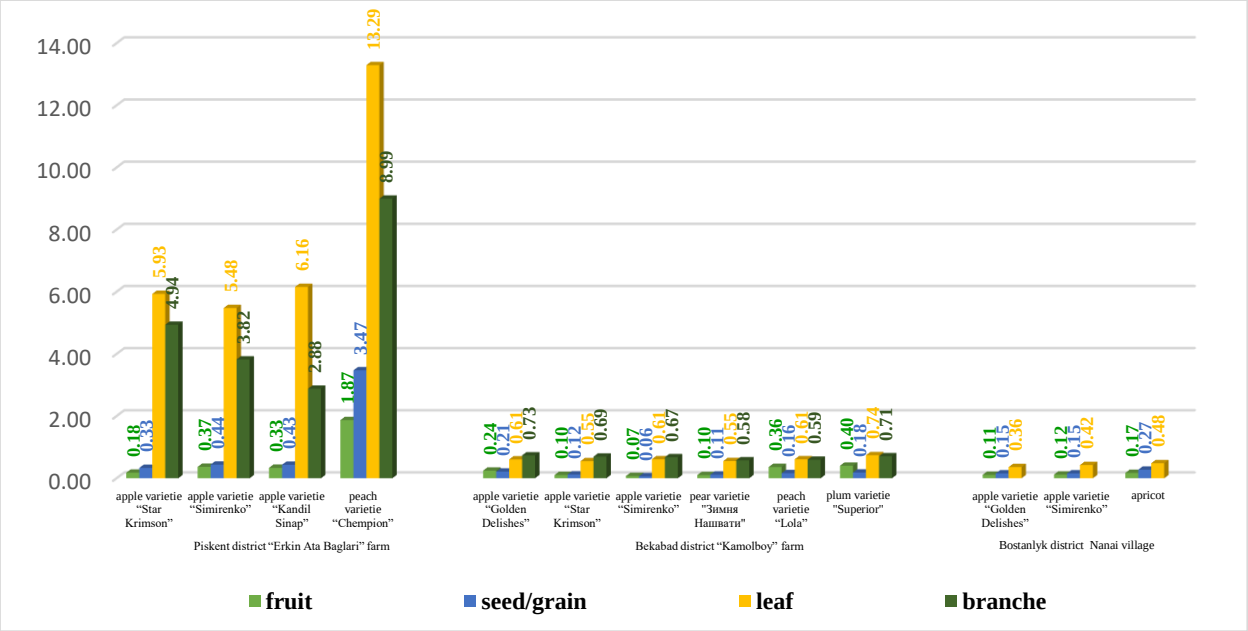

Figure 2. Bioaccumulation of lead (Pb) in vegetative and generative organs of fruit trees, mg/kg dry matter (2021-2023)

Conclusion. The accumulation of chromium and lead in the vegetative and generative organs of fruit trees varies depending on the type and variety of fruit.

The chromium (Cr) element accumulates in the leaves of fruit trees at a level of 0.27-0.82 mg/kg, in the shoots at a level of 0.25-0.50 mg/kg, in the seeds at a level of 0.07-0.24 mg/kg, and in the fruits at a level of 0.02-0.16 mg/kg.

The lead (Pb) element accumulates in the leaves of fruit trees at a level of 0.36-13.29 mg/kg, in the shoots at a level of 0.58-8.99 mg/kg, in the seeds at a level of 0.06-3.47 mg/kg, and in the fruits at a level of 0.07-1.87 mg/kg.

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