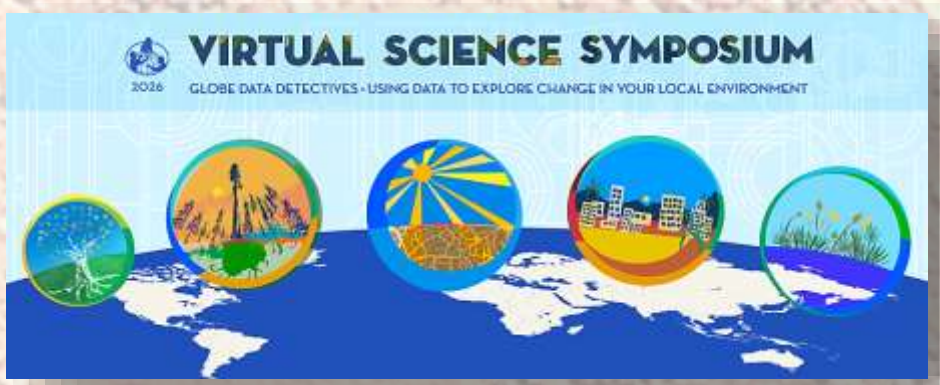

ARE THERE RED SOIL IN THE LABIN AREA?

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Srednja škola Mate Blažine Labin

SECONDARY SCHOOL MATE BLAŽINE LABIN, CROATIA

INTRODUCTION

According to geological composition and soil differences, Istria is divided into three units:

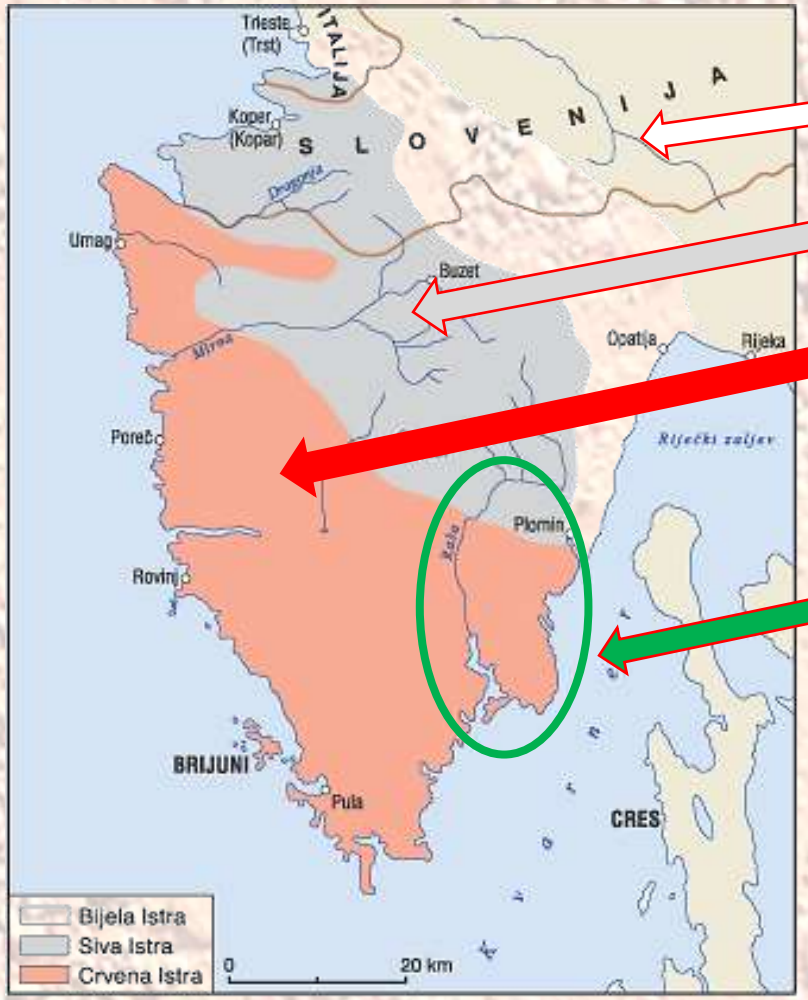

Figure 1. Geological map of Istria
Source: https://www.geotech.hr/geoloska-grada-istre/

WHITE ISTRIA – elevated, rocky areas composed of karstified limestone.

GREY ISTRIA – central Istria, a depression filled with flysch.

RED ISTRIA – western Istria, lying on limestone–dolomite bedrock, where terra rossa dominates.

LABINŠTINA, Italian L'Albonese,
a geographical and historical name for the eastern part of Istria, between the Raša River, Čepić Field, Plomin Bay, the southern part of the Učka Massif and the Kvarner Bay.

Considering the geological structure, the Labinština area is mostly located in the area of red Istria, named after the red soil, **TERRA ROSA.**

RESEARCH QUESTION AND HYPOTHESIS

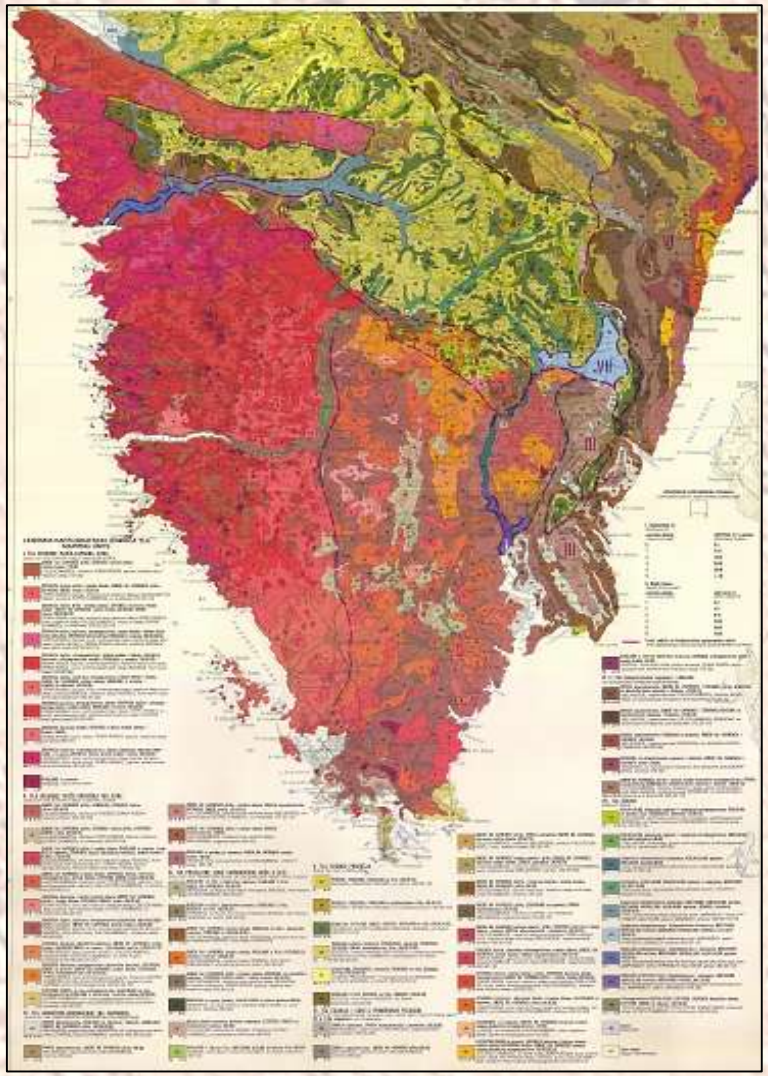

Figure 2. Pedological map of Istria County
Source:https://esdac.jrc.ec.europa.eu/images/Eudasm/HR/PDF/russ_x85.pdf

Terra rossa is a type of red soil characteristic of subtropical and Mediterranean karst regions, i.e. areas composed of limestone that receive significant amounts of precipitation. This type of soil is formed by the dissolution of limestone and dolomite and represents its undecomposable residue, and forms on the bottom of ravines, valleys and karst fields.

According to the pedological map [8], six types of red soil occur in the Labin region.

We therefore asked:

1. Where in the Labin area can red soil be found, and do these locations correspond to the pedological map?
2. What type of land cover exists at these sites?
3. What are the physical and chemical properties of the red soil at the selected locations?

RESEARCH METHODS AND MATERIALS

The study involved **36 members** of the GLOBE group.
The research took place **from September 2024 to October 2025.**
Cooperation with local residents helped identify sampling locations.

The research is divided into two parts: fieldwork in which we recorded the coordinates of the measurement sites, determined the type of cover and took soil samples, which we determined the basic properties of in the field, and in the second part we analyzed the physicochemical properties of the soil in the school laboratory.

In our work, we used the following work methods:
We used Globe GPS protocols to determine geographic coordinates and Globe MUC protocols for land cover. For soil analysis, we used the Globe protocols for soil and the Field Work Guide, and to determine the properties that are not included in the fine protocols, we followed the instructions of the test kits.

Figure 3. Field work

Figure 4. Work in a school laboratory

RESULTS AND DATA ANALYSIS

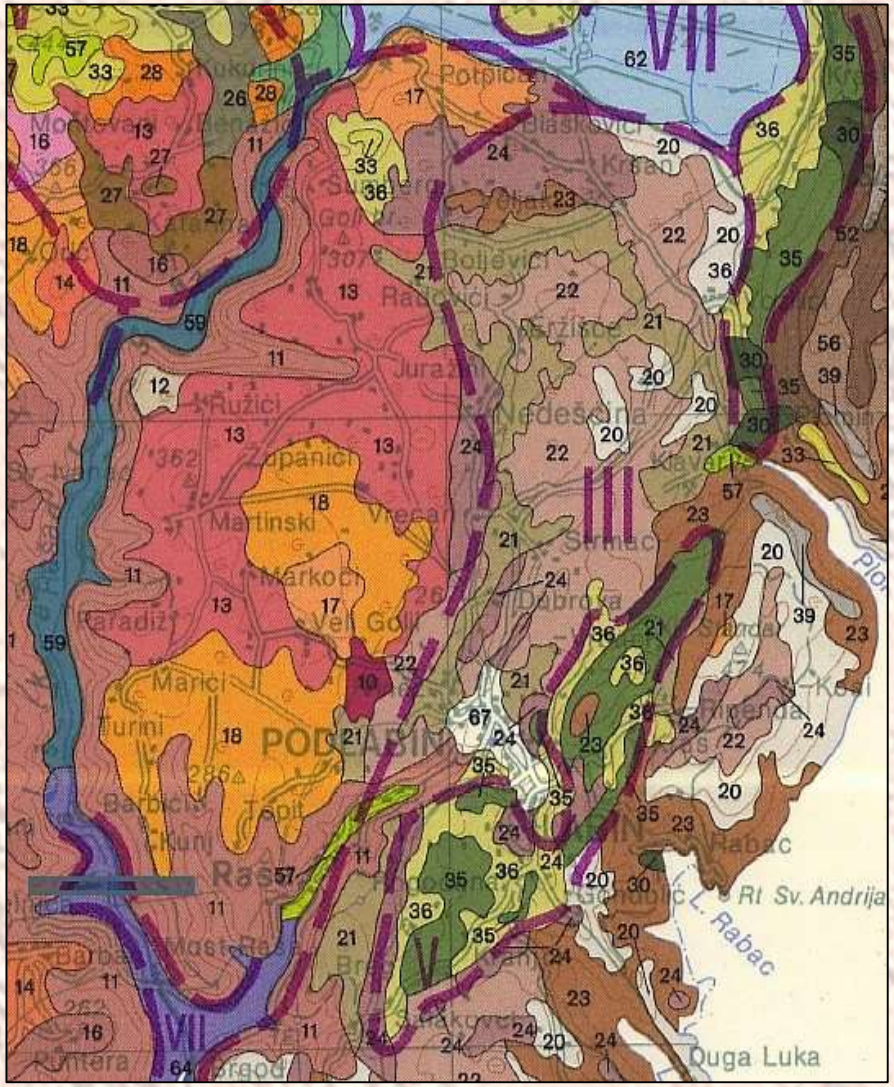

Figure 5. Excerpt from the pedological map of the County of Istria, Labinština.
Source:https://esdac.jrc.ec.europa.eu/images/Eudasm/HR/PDF/russ_x85.pdf

According to the pedological map of Istria County, ***terra rossa*** appears **in six cartographic units (10, 11, 12, 13, 17, 18)** across the Labin area.

Table 1. lists sampling locations, soil types, and sample photographs.

NUMBER NAME OF LOCATION	TYPE ACCORDING TO THE PEDOLOGY MAP OF ISTRIA		SAMPLES COLLECTED IN THE FIELD
1. VINEŽ	10	RIGOLANO from red soil	
2. RAŠA	11	RED typical shallow BROWN ON LIMESTONE shallow stone	
3. RUŽIĆI	12	RED typical shallow BROWN ON LIMESTONE shallow EUTRICH BROWN sinkhole	
4. RADOVIĆI	13	RED SOIL typical shallow (partially bauxite) medium deep and deep BROWN ON LIMESTONE shallow and medium deep RIGOLANO from red soil and brown on limestone	
5. VELI GOLJI	17	RED clay leached (partially bauxite) BROWN ON LIMESTONE medium deep DISTRICT BROWN on red clay LEESIFIED acrylic	
6. MARIĆI	18	RED clay leached, anthropogenic (partially bauxite) DISTRICT BROWN on red clay BROWN ON LIMESTONE medium deep LEESIFIED acrylic, anthropogenic	

GEOGRAPHIC COORDINATES AND MUC CLASSIFICATION

Figure 6. Measuring points
Source: https://www.google.com/maps

Table 2. Geographic coordinates and MUC classification of cover

GEOGRAPHICAL COORDINATES				MUC	LAND COVER
LOCATION	LATITUDE N	LONGITUDE E	ELEVATION (m)		
1. VINEŽ	45.097250°	14.106910°	210	433	Shrub vegetation
2. RAŠA	45.064822°	14.064753°	34	121	Deciduous dry forest
3. RUŽIĆI	45.139722°	14.038611°	172	56	Bare karst – sinkhole
4. RADOVIĆI	45.163980°	14.091980°	181	121	Deciduous dry forest
5. VELI GOLJI	45.110383°	14.074633°	298	121	Deciduous dry forest
6. MARIĆI	45.100449°	14.042630°	266	433	Shrub vegetation

We found areas where red soil prevails,
so we took samples at **6 locations** to investigate
the properties this types of red soil.

All samples were taken on an uncultivated area so that the application of agrotechnical measures would not affect the soil properties, from a depth of 20 cm.

The cover in the investigated areas is mostly deciduous forests of oak, hornbeam, ash and macchia, and only in Ružići is there bare karst.

SOIL PROPERTIES

Table 3. Basic properties

PROPERTY	LOCATION					
	1. VINEŽ	2. RAŠA	3. RUŽIĆI	4. RADOVIĆI	5. VELI GOLJI	6. MARIĆI
STRUCTURE	Granular	Blocky	Blocky	Granular	Blocky	Granular
COLOR	10R3/4 reddish brown	10YR3/2 grey-brown	10R4/2 light brown	10R3/6 brownish red	10R4/2 light brown	10YR2/4 dark brown
CONSISTENCY	Loose	Loose	Firm	Firm	Loose	Loose
STONE CONTENT	Low	Low	Low	Low	High	Low
ROOT CONTENT	Low	Low	Low	Low	High	Low
CARBONATES	3–5%	3–5%	3–5%	3–5%	3–5%	<1%

Figure 7. Samples Terra rossa

Table 4. Physicochemical properties of samples

PROPERTY	UNIT	LOCATION					
		1. VINEŽ	2. RAŠA	3. RUŽIĆI	4. RADOVIĆI	5. VELI GOLJI	6. MARIĆI
SAND	%	22.5	35.9	35.5	21.5	27.7	31.5
SILT	%	32.0	33.2	12.2	32.5	35.6	32.5
CLAY	%	45.5	30.9	52.3	46.0	36.7	36.0
SOIL TYPE		Clay	Clay loam	Clay	Clay	Clay loam	Clay loam
PERMEABILITY	%	55	70	68	49	59	65
pH	pH units	5,7	6,7	7,4	5,5	5,5	5,7
CONDUCTIVITY	µS	345	80	180	360	980	432
N-P-K		low	medium	low	low	low	low
HUMUS		low	high	low	low	low	low
POTASSIUM	mgL^{-1}	50	50	50	50	50	50
CHLORIDES	mgL^{-1}	0	0	0	0	0	0
SULFATES	mgL^{-1}	<200	<200	<200	<200	<200	<200
NITRATES/NITRITES	mgL^{-1}	5	10	5	10	1	1
PHOSPHATES	mgL^{-1}	3.25	2.26	1.63	1.63	1.63	1.63
COPPER	mgL^{-1}	1	1	1	1	1	1
IRON	mgL^{-1}	3	3	1,5	1.5	1.5	1.5
LEAD	mgL^{-1}	0	0	0	0	0	0
MERCURY	mgL^{-1}	0	0	0	0	0	0

DISCUSSION & CONCLUSION

We sampled six locations corresponding to the pedological map units containing red soil.
All samples were taken at 20 cm depth from uncultivated terrain.

Most sites were covered by deciduous forests (oak, hornbeam, ash) or macchia;
only Ružići had bare karst terrain (sinkhole).

Key findings:

- Soil structure ranged from granular to blocky.
- Consistency was loose in four samples and firm in two (Ružići, Radovići).
- Soil color ranged from reddish brown to dark brown (Munsell 10R–10YR).
- Carbonate content was up to 5%, except one sample (Marići) with <1%, consistent with non-carbonate *terra rossa*.
- Clay content ranged from 30.9% (Raša) to 52.3% (Ružići).
- Three samples were classified as clay soils (Vinež, Ružići, Radovići) and three as clay loams (Raša, Veli Golji, Marići).
- Water permeability was higher in samples with more sand.
- pH values ranged from slightly acidic to neutral (5.5–7.4), typical for red soils.
- Humus and nutrient content was generally low.
- Harmful substances (chlorides, sulfates, heavy metals) were negligible.

As the literature sources that we managed to find on the internet mainly refer to the analyzes of specific samples taken in different places such as India, Greece, it did not help us for comparison, so we extracted the basic properties and use of red soil from the presentation entitled Cambic soils.

Figure 8. Terra rossa
Source: https://pedologija.com.hr/Literatura/Pedogeneza/Automorfna_III.pdf

Comparing our results with literature (e.g., *Cambic soils* presentation), **we conclude** that red soli (*terra rossa)* occurs in 10–30% of the mapped units, and in one unit even around 40%.

Therefore, we confirm our hypothesis:

The Labin region is part of Red Istria and contains characteristic ***terra rossa*** soils.
These areas are already used for vineyards and olive groves, although many fields remain uncultivated.

We conclude with an announcement in Glas Istra,
which gives us hope that in Labinština the areas under red soil will be adequately used
so that no only holiday homes will spring up on them.

RURALNI RAZVOJ

VINARI I MASLINARI LABINŠTINE OZBILJNO HVATAJU KORAK S OSTATKOM POLJOPRIVREDNE ISTRE: Vrhunska ulja i vina nova su turistička ponuda Labina

Figure 8. Published by Glas Istra
Source: https://www.glasistre.hr/

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BADGE DESCRIPTIONS

I am a Data Scientist

We collected soil samples from six locations in the Labin region, analyzed their physical and chemical properties in the school laboratory, and compared the results with the pedological map of Istria.
We presented the results in tables and interpreted them to confirm our hypothesis
about the presence of terra rossa.

I am an Earth System Scientist

Our research applied several GLOBE protocols (GPS, MUC, Soil) and showed the connection between the pedosphere, biosphere, and atmosphere. We studied how soil types are linked to vegetation cover, geological structure, and local climatic conditions in the Mediterranean environment.

I am a Collaborator

Our project involved 36 students working in teams: some collected data in the field while others performed laboratory analysis. We collaborated with local residents to identify locations, and we combined all results to reach our conclusions.
This teamwork helped us complete the project successfully.

I make an Impact

Our study showed that parts of the Labin region belong to Red Istria and are suitable for viticulture, olive growing, and fruit production. We highlighted the importance of preserving this valuable soil and suggested its sustainable use instead of abandonment or urbanization.
In this way, our research can inspire positive action in the local community.