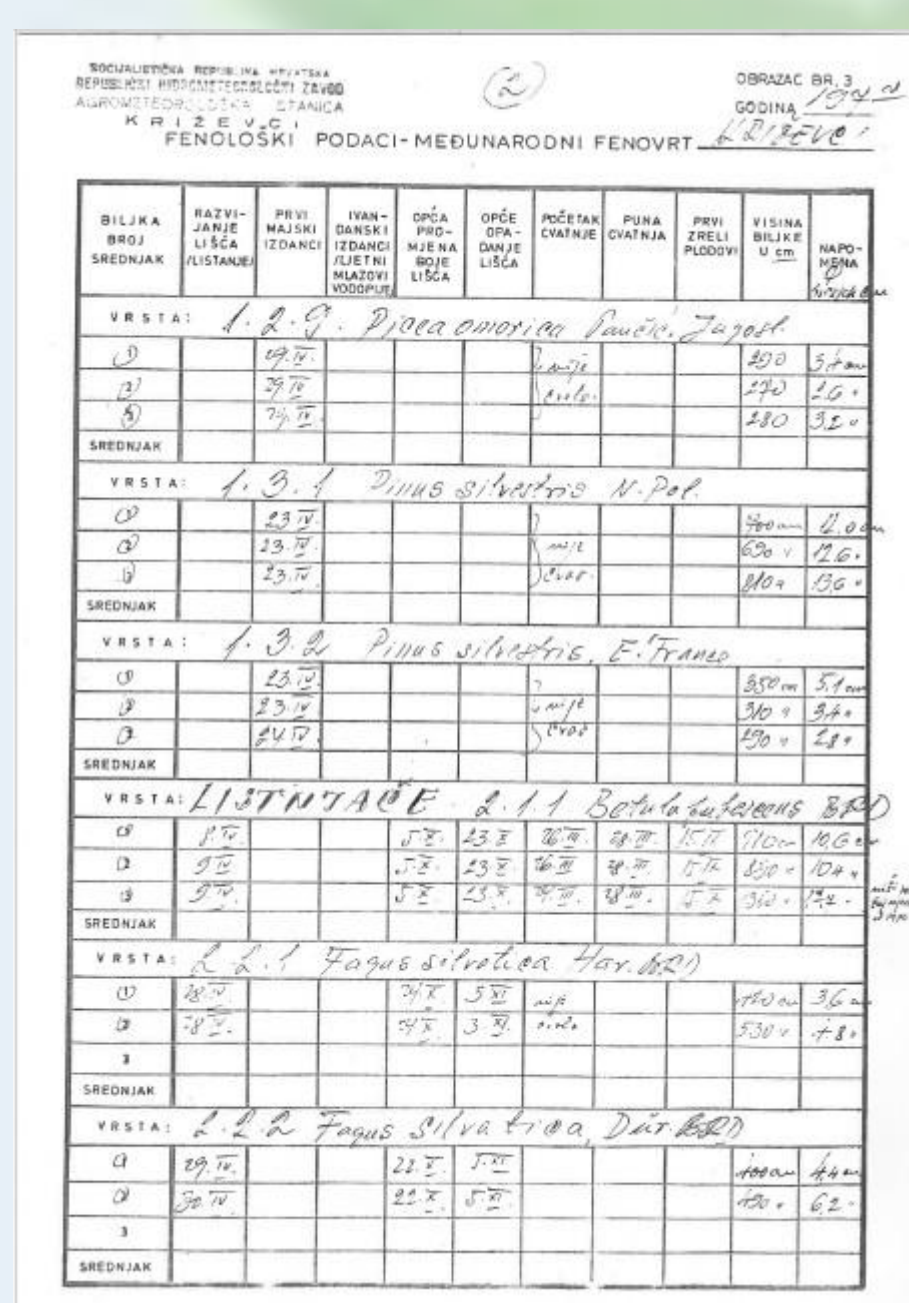


# Quality Control and Validation System for Phenological Data

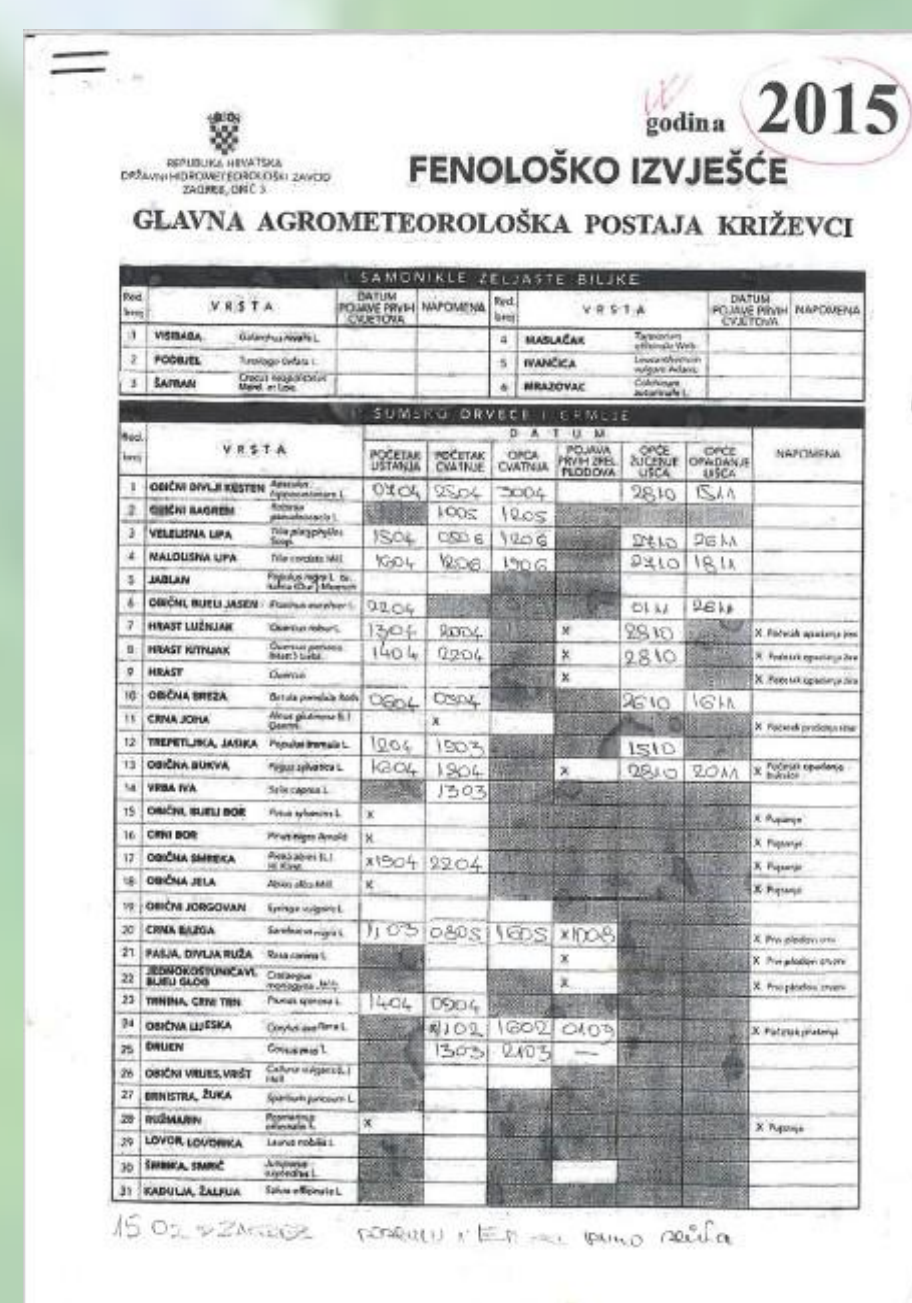


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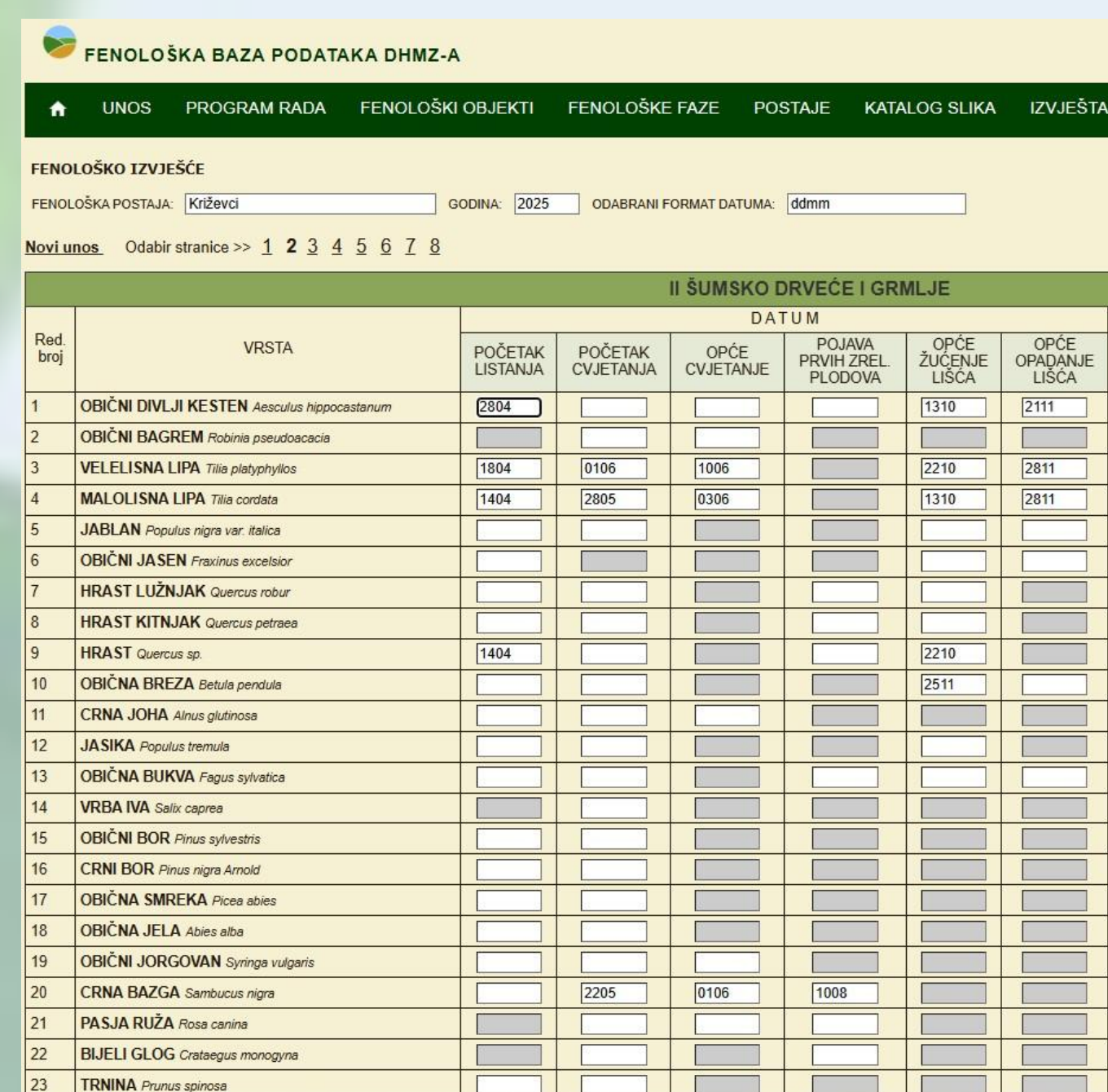
Phenological data are important indicators of how biological systems respond to climate change. Phenological observations in Croatian Meteorological and Hydrological Service started in 1951 and were initially documented on paper forms. In 2019 IT department created digital phenological database and migrated all collected data into it. Since then, phenological observers have had direct access to the database, enabling real-time data entry. Having all data in one place created both the opportunity and the need for systematic data quality control.



Hand-written paper form



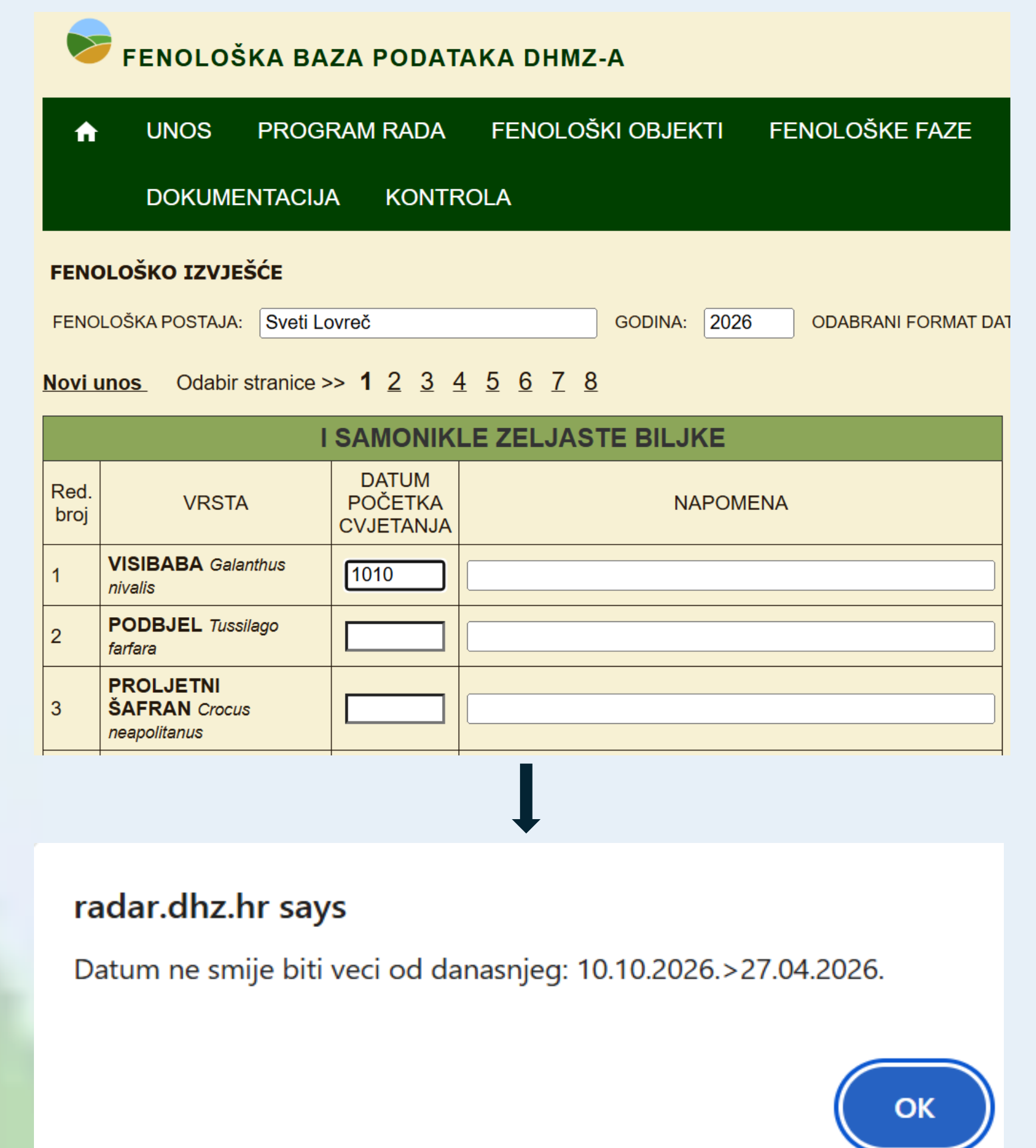
Standardized paper form



User interface in digital database

Data quality control system consists of three steps:

## 1. Preventing the entry dates later than the current date.



**FENOLOŠKA BAZA PODATAKA DHMZ-A**

UNOS PROGRAM RADA FENOLOŠKI OBJEKTI FENOLOŠKE FAZE  
DOKUMENTACIJA KONTROLA

FENOLOŠKO IZVJEŠĆE

FENOLOŠKA POSTAJA: Sveti Lovreč GODINA: 2026 ODABRANI FORMAT DATA

Novi unos. Odabir stranice >> 1 2 3 4 5 6 7 8

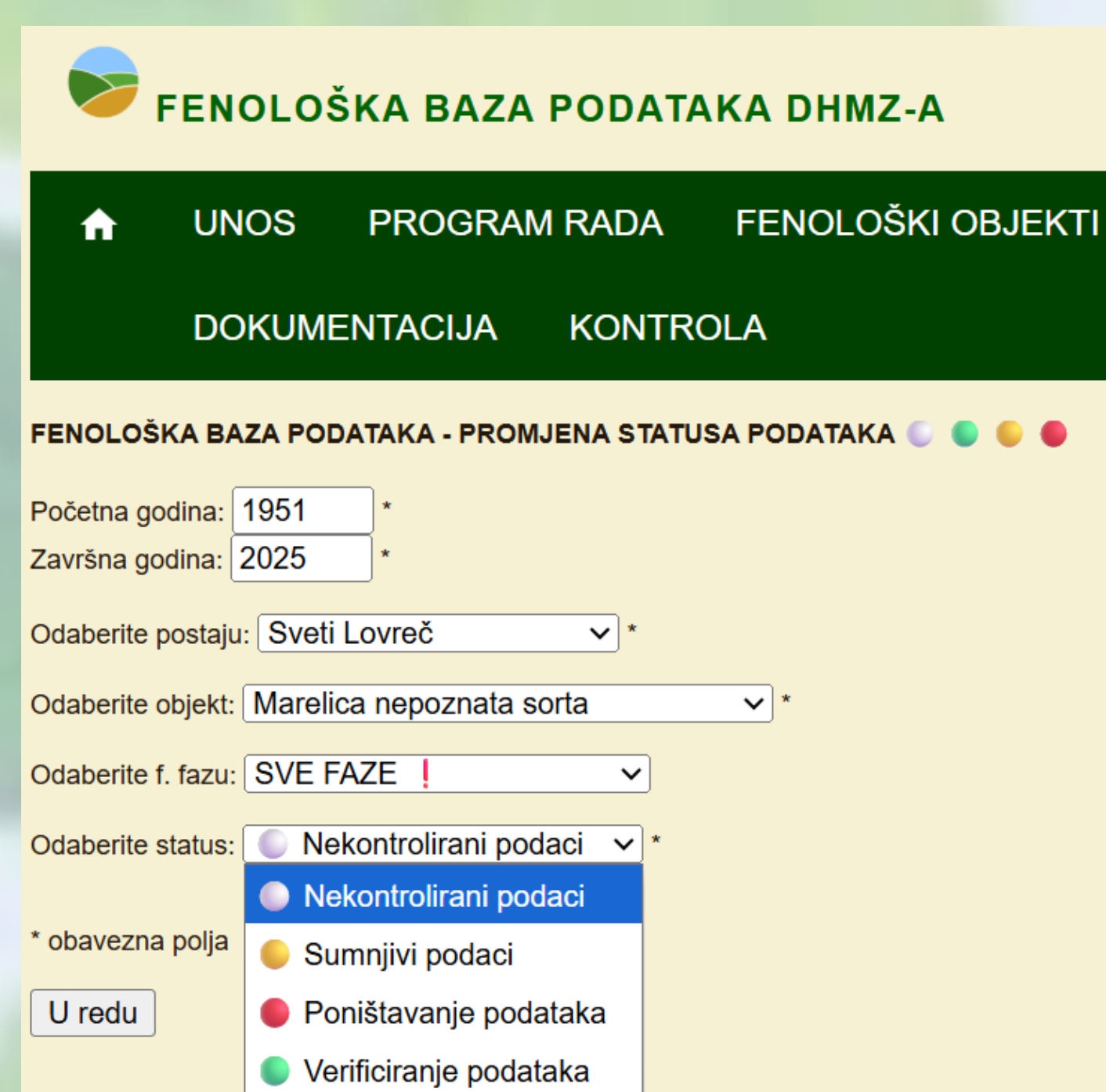
Red. broj	VRSTA	DATUM POČETKA CVJETANJA	NAPOMENA
1	VISIBABA <i>Galanthus nivalis</i>	1010	
2	PODBJEL <i>Tussilago farfara</i>		
3	PROLJETNI SAFRAN <i>Crocus neapolitanus</i>		

radar.dhz.hr says  
Datum ne smije biti veći od danasnjeg: 10.10.2026.>27.04.2026.

OK

If the entered date is in the future, the system generates a message: “The date must not exceed the current date: 10.10.2026. > 27.04.2026.”

By default, all data in the database have the status “uncontrolled data”. After data review and validation, a status is assigned. Data can be assigned one of the following statuses: suspicious data, verified data and rejected data. Suspicious data indicates that after quality control process some uncertainties remain that need to be clarified by contacting the observer. Verified data means that the data are correct and ready for use. Rejected data means that the data are incorrect, can not be corrected, and are therefore discarded.



**FENOLOŠKA BAZA PODATAKA DHMZ-A**

UNOS PROGRAM RADA FENOLOŠKI OBJEKTI  
DOKUMENTACIJA KONTROLA

FENOLOŠKA BAZA PODATAKA - PROMJENA STATUSA PODATAKA

Početna godina: 1951  
Završna godina: 2025

Odaberite postaju: Sveti Lovreč

Odaberite objekt: Marelica nepoznata sorta

Odaberite f. fazu: SVE FAZE

Odaberite status: Nekomolirani podaci

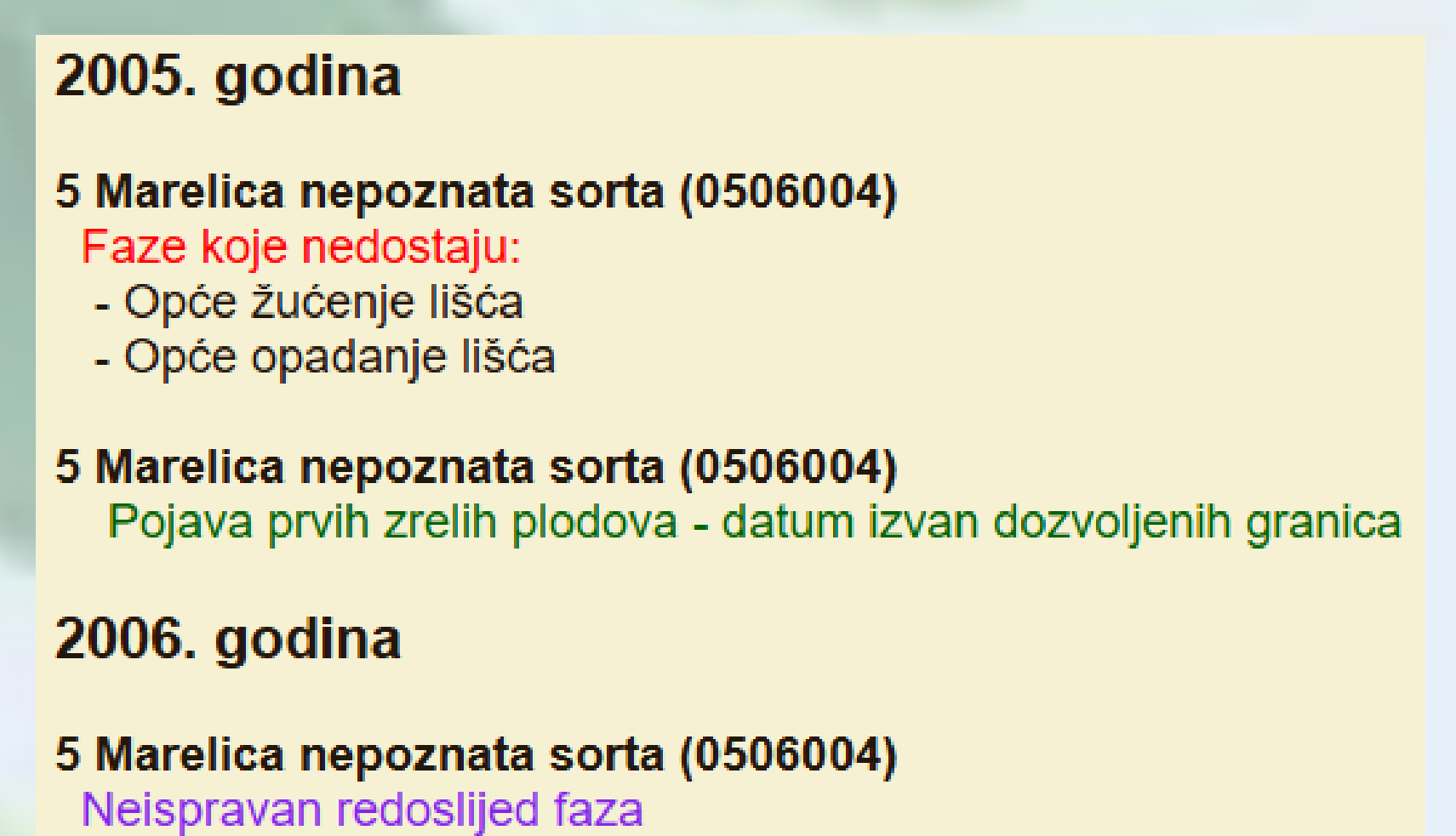
\* obavezna polja

- U redu
- Nekomolirani podaci
- Sumnjivi podaci
- Poništavanje podataka
- Verificiranje podataka

Within the data status interface phenological expert selects the timeline (start and end year), as well as the phenological station, object, phase and data status.

- White dot: uncontrolled data
- Yellow dot: suspicious data
- Red dot: rejected data
- Green dot: verified data

## 2. Verification of time-series completeness, verification of the sequence and verification of phenophase intervals.



**2005. godina**

5 Marelica nepoznata sorta (0506004)  
Faze koje nedostaju:  
- Opće zućenje lišća  
- Opće opadanje lišća

5 Marelica nepoznata sorta (0506004)  
Pojava prvih zrelih plodova - datum izvan dozvoljenih granica

**2006. godina**

5 Marelica nepoznata sorta (0506004)  
Neispravan redoslijed faza

Red text indicates an incomplete time series and specifies the missing phenophases. Purple text indicates that the phenophases are in wrong order. Green text indicates that entered phenophase falls outside the expected time range.

## 3. Review of the flagged errors

Third step implies a review by the phenology specialist of the errors flagged by the application. Observer remarks (prolonged drought, heavy rainfall, pest attack, hail damage, fruit consumption by birds, tree pruning, wind damage to the tree) are considered. When necessary, the specialist contacts the observer to clarify any uncertainties (typing error, day and month reversed).