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## PHENOLOGY

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The beginning of phenological observations in the territory of Slovenia dates back to the 1760s when our world renowned botanist SCOPOLI began his observations of the plant development of different species. He described typical season occurrences during the development stages of plants in his fundamental work *Calendarium florum carniolicum* in 1762. There he exposed only a few phenological stages of plants but he explicitly demonstrated that the biorhythms of plant development depend on the influence of the environment and certainly on a plant's particular physiological properties.

The very beginning of phenological activities in Slovenia came in 1950-1951 when a network of special phenological stations was established. The stations were installed and controlled mostly at the existing meteorological stations of different types (so-called temperature and precipitation stations). Their main purpose was to conduct both phenological and meteorological observations in the same place. Some phenological stations do not

include meteorological stations due to the high altitudes where there are no villages or urban settlements.

In 1950 only 30 phenological stations had been activated, while in the 1960s there were more than 120 stations but later their number dropped and finally stopped at 60 high quality phenological stations (since 1980). They continuously provide representative information during the vegetation seasons and some of them throughout the year.

An important criterion for the installation of phenological stations in certain areas was the inclusion of larger designated areas like forests and large agricultural complexes (grape growing regions, fruit growing regions and field crop regions).



Phenological stations in Slovenia, 2006

Today the disposition of all phenological stations in the country is accurate and most regional units (regions) are covered uniformly.

## International Phenological Garden (IPG)

Besides phenological observations at the 60 Slovenian phenological stations after 1958 we began making regular phenological observations of trees planted in Tivoli Park in Ljubljana. All trees were brought from the same place (Germany) where they were all planted from the same genetic (parent) material. There are 68 such IPGs in Europe and more precise observations allowing the better cross-comparison of data have been going on for nearly 50 years.



International Phenological Garden (number 55) in Ljubljana's Tivoli Park

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## Programme of Phenological Observations

This consists of regular observations of characteristic phenomena during the period of plant development in the vegetation season and is in accordance with the phenological programmes known in other European countries. There are slight differences in the selection of phenological objects in the group of autochthon plant species.

### Phenological objects

The observers at the phenological stations observe non-cultivated and cultivated plants growing in the neighbourhood of the stations. Their obligation is to watch typical field work in agricultural areas within the vicinity of the station.

Groups of phenological objects:

1. non-cultivated herbaceous plants
2. forest trees and bushes
3. clover and grasses
4. field crops
5. fruit trees
6. vines

7. bees
8. common agricultural practices

### Phenological phases

The programme of phenological phase observations in our country is similar to that found in other European countries.

The criteria used in the observation and determination of phenological phases are the same as used elsewhere in Europe.

The phenological phases of each of the numerated six groups of phenological objects are different and some of them can include 10 phases. The following phenological phases for example are observed with fruit trees, irrespective of the particular species:

- beginning of leaf folding,
- beginning of flowering,
- general flowering and end of flowering,
- beginning of ripening,
- harvest

and two general autumn phases:

- autumn colouring, and
- leaf fall.



Apple tree in full bloom (Jonagold)



Cherry tree starting to ripen (Napoleon)



Ripe pears (pakham triumph)

The method changes slightly for the observation of Mediterranean plants such as: olive trees, lemon trees, orange trees, pomegranate trees and fig trees.

The observation of pests and plant diseases stopped in 1983. In the same year the observation of the migration of three sorts of migratory birds was cancelled.

Observations of common agricultural practices include spring field works, haymaking, the harvest of winter crops and field soil preparation before winter.

## Phenological Records and Future Orientation

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**R**ich phenological data records are available for the period since 1951. The most useful are those for fruit trees and vines as well as for non-cultivated plants.

Our main task for the future is to preserve the existing number of phenological stations in order to ensure permanent data collection and observation continuity.

The circumstances of agricultural production require additional information concerning phenological development. For that reason we intend to incorporate new agricultural crops and spices.