PHENOLOGICAL DATA EXCHANGE OF CULTURAL PLANTS OF CENTRAL EUROPEAN COUNTRIES

IZMENJAVA FENOLOŠKIH PODATKOV ZA GOJENE RASTLINE MED DRŽAVAMI OSREDNJE EVROPE

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POVZETEK

Na pobudo Madžarske meteorološke službe so se decembra 1995 med državami osrednje Evrope začeli pogovori o uporabi in koristnosti fenoloških podatkov v agrometeorologiji. Vodilo pogovorov je bilo povečati uporabnost fenoloških podatkov v operativne namene ter ustvariti bazo podatkov za izmenjavo ter regionalni prikaz izbranih kulturnih ter negojenih rastlin. Devet držav se je pridružilo omenjeni aktivnosti, med njimi tudi nekaj držav iz Balkana. Opaziti je bilo različne načine opazovanja, zapisovanja ter obdelave fenoloških podatkov med posameznimi sodelujočimi državami (Češka, Madžarska, Nemčija, Poljska, Slovaška, Slovenija). Nestandardiziranost fenoloških podatkov predstavlja največji problem v povezavi z mednarodno uporabo le-teh. Pri opazovanju gre v večini primerov za opisne in ne številske podatke, pri čemer je očitno pomanjkanje standardnih metod opazovanj razvojnih stopenj rastlin. Administrativne meje omejujejo koriščenje fenoloških podatkov na mednarodni ravni, poleg tega pa različni metodološki pristopi, vključno z zapisovanjem podatkov, omogočajo uporabo fenoloških podatkov samo med kompatibilnimi sistemi. Za vzpostavitev regionalnih baz fenoloških podatkov so bili predlagani naslednji kriteriji: 1) zadostno število reprezentativnih fenoloških postaj; 2) enotna izbira rastlin; ter 3) univerzalen zapis podatkov, ki bi služil morebitni izmenjavi. Poskusno je bil v namene izmenjave izbran enoten zapis za osnovne fenološke faze kulturnih rastlin glede na metodologijo, ki jo uporabljajo v posameznih državah. Za vegetacijsko obdobje 1995/1996 so bile za primerjavo izbrane sledeče kulturne rastline: ozimna pšenica, koruza, (oljna) repica in krompir ter njihove tipične fenofaze. Izbira postaj je bila prepuščena posameznim državam osrednje Evrope, katere območje je bilo definirano kot območje med zahodno mejo Nemčije ter vzhodno mejo Poljske, ter med Baltiškim in Jadranskim morjem. Skupno število opazovalnih postaj je bilo 255 (Češka - 78, Madžarska - 12, Nemčija - 20, Poljska - 30, Slovaška - 63, Slovenija - 52). Ker se podatki v posameznih državah zapisujejo v različni obliki, je bila izdelana univerzalna oblika zapisa fenoloških podatkov. Še vedno pa so se v povezavi z izmenljivostjo podatkov pojavljale številne težave, kot na primer neopazovanje nekaterih fenofaz, različni aspekti opazovanj (popolna zrelost/začetek zrelosti) ter različna časovna perioda opazovanj (2 do 10 dni). Zaradi tega sodelujoče države menijo, da je nesmiselno povečevati število obravnavanih rastlin in fenofaz, temveč tudi v prihodnje opazovati omenjene rastline in njihove fenofaze ter obstoječim podatkom tako pridružiti nove časovne nize. Poleg tega, naj bi bila v prihodnje večja teža na reprezentativnosti postaj ter interpretaciji podatkov in ne na številčnosti le-teh.

Ključne besede: fenologija, baze podatkov, izmenjava podatkov

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Phenological observation form the necessary part of agrometeorological information system both in long-term evaluation and in operational practice. First systematic and regular observation on the country level of cultural crops and wild plants started in most of Central European Countries (CEC) in the middle of 19 th century. Though the region of CEC is relatively homogenous there is no uniform access to the phenological observation and the range of the observed plants also varies from country to country.

Following the initiative of Hungarian Meteorological Service the discussion of the CEC countries around the use and benefit of phenological data in agrometeorology started in December 1995 and continued for two times. The aim of this effort is to increase the usage of phenological data in operational use and to create a base for data exchange and possible regional evaluation of phenological manifestation of selected crops and wild plants. Nine countries, including some Balkan countries joined this activity. Different ways of observing, coding and processing phenological data in these countries were recognised.

The meteorological data for agrometeorological purposes are measured in each country quite extensively and usually recorded by using standard procedures. Phenological data are not so well defined and are not measured in any standardised manner. Observing phenological data many descriptive elements occur in the methodology and there is lack of references to standardised procedures for observing growth stages. While meteorological and climatic data are at a certain level suitable for international data exchange, the discuss has shown many obstacles in phenological data accessibility for exchange purposes. Firstly formal and administrative boundaries restrict the utilisation of phenological data at the international level, secondly different methodological accesses including coding enable to use the phenological data just in the compatible system of processing. Though the general access to the observation is very similar many detail differences require to find any common expression of observed data that would make the data comparable. Thus to create any regional database of phenological data following criteria were considered:

-sufficient number of representative phenological stations;
-uniform crop/fruit tree selection;
-any universal coding that could serve as a platform for data exchange.

For the exchange purpose decadic code (concept of BBCH scale) was adopted to be used for the definition of basic phenological phases of the crops with the respect to the methodology used in each country. Considering two first criteria following intersection of plant and phenological phases during the vegetation season 1995/1996 was selected to create a pattern of restricted regional database of cultural plants:

Field plants

	Crop plant selected			
phenological phase	winter wheat	maize	rape	potato
sowing/planting	x	x	x	x
emergence at 50 %	x	x	x	x
first flowers	-	-	x	x
beginning of heading	x	x	-	-
beginning of tasseling	-	x	-	-
canopy closure	-	-	-	x
full ripe	x	x	x	-
harvest	x	x	x	x

Fruit trees

	Fruit tree selected		
phenological phase	sweet cherry	red currant	potato
first leaves	-	x	x
first flowers	x	x	x

All the data were expressed in the term of Julian day that represents the occurrence of the defined phenological phase together with variety description as a notice. As the data are recorded and archived at various formats from country to country an uniform formular was created for the data collection in ASCI II code, Excel version respectively.

Station selection was individual according to the country and varied considerably as some stations provided data for all selected crops and trees while some of stations were represented just by one plant.

This way the data from 255 phenological stations from six countries were collected with following station distribution:

Czech Rep.	Germany	Hungary	Poland	Slovakia	Slovenia	Total
78	20	12	30	63	52	255

Thus the area of Central Europe was represented from the western border of Germany to the eastern border of Poland and from Baltic to Adriatic see with following co-ordinates of "marginal stations":

Station	Latitude	Longitude
BREDSTEDT	54° 37`	08° 58`
RIZANA	45° 33`	13° 51`
ZAMOSC	50° 42`	23° 15`
ESCHWEILER	50° 49`	06° 16`

Top altitude : KOPRIVNIK - 1000 m a.s.l.
Min. altitude : BREDSTEDT - 10 m a.s.l.

Despite of the fact that the above described activity arose as a result of previous discussion the sets of data at each particular plant were not covered enough by data and some detail discounts have occurred:
- the absence of the data of some phenological phases (full ripe, first leaves)
- different point of observation in some cases (full ripe/beginning of ripe)
- different time step of observation/interpretation (from 2 to 10 days).

Considering these incorrectness it looks profitable for the future to restrict the number of stations with the particular plant and to focus on the representativity of the station position and data interpretation.

Final data interpretation should give us a review of the phenological cycle of the selected plant within the region. For this purpose the conversion to a graphic system was done and all the data can be interpreted in the map form (see a pattern in APPENDIX).

Recognising the obstacles in the even restricted uniform phenological database the CEC participant countries suggested not to widen the existed number of plants and phenological phases entering such database, but to follow in this activity regularly adding the data sets of next season of vegetation 1996/97.

APPENDIX (maps of phenological phases of winter wheat within the CEC region in the season 1995/96)

1. **SOWING**
2. **BEGINNING OF HEADING TO HARVEST**
3. **HARVEST**

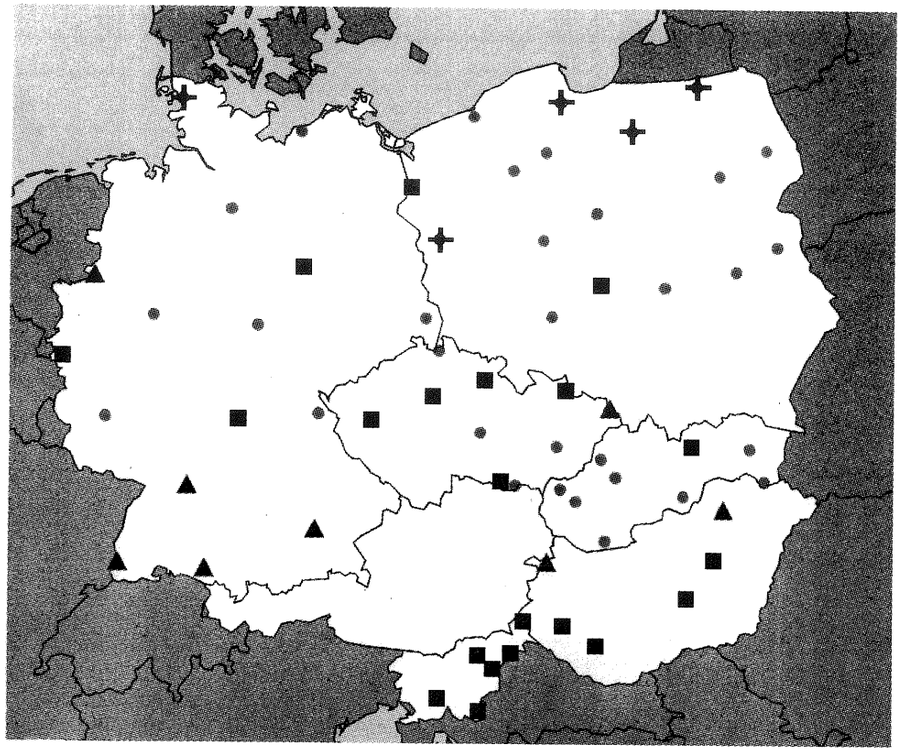

Figure 1: Project on phenology of CEC – phenophase *sowing of winter wheat* in the season 1995/96.

Legend:

- ▲ 22.10.- 06.11.
- ■ 07.10.-21.10.
- ● 22.09.-06.10.
- ✚ 05.09.-21.09.

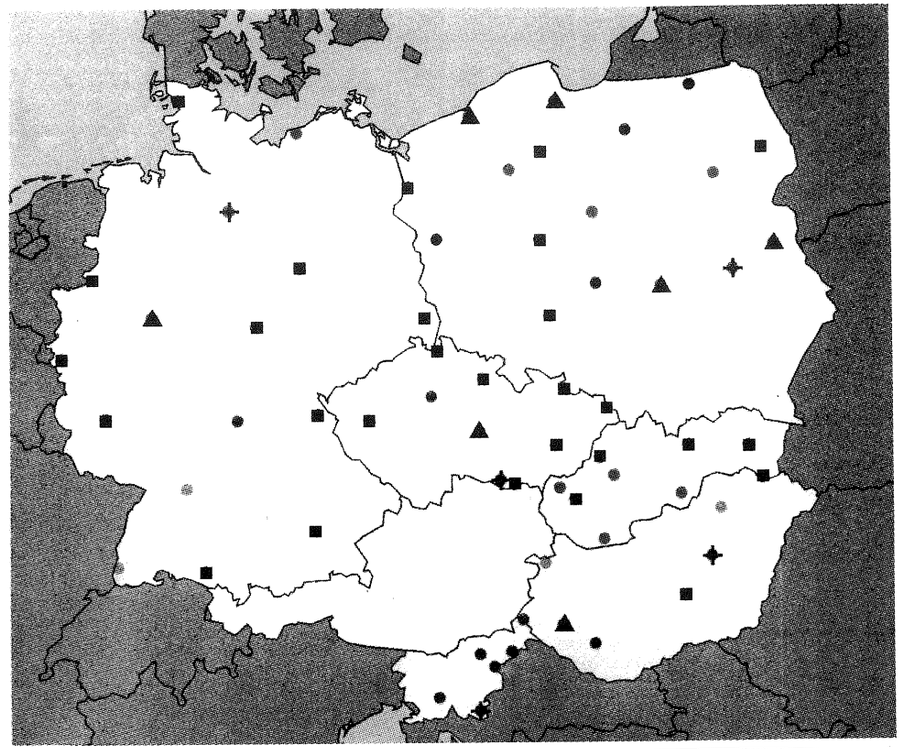

Figure 2: Project on phenology of CEC – phenointerval (in days) *beginning of heading to harvest of winter wheat* in the season 1995/96.

Legend:

- ▲ 92 - 81
- ■ 80 - 69
- ● 68 - 56
- ✚ 55 - 48

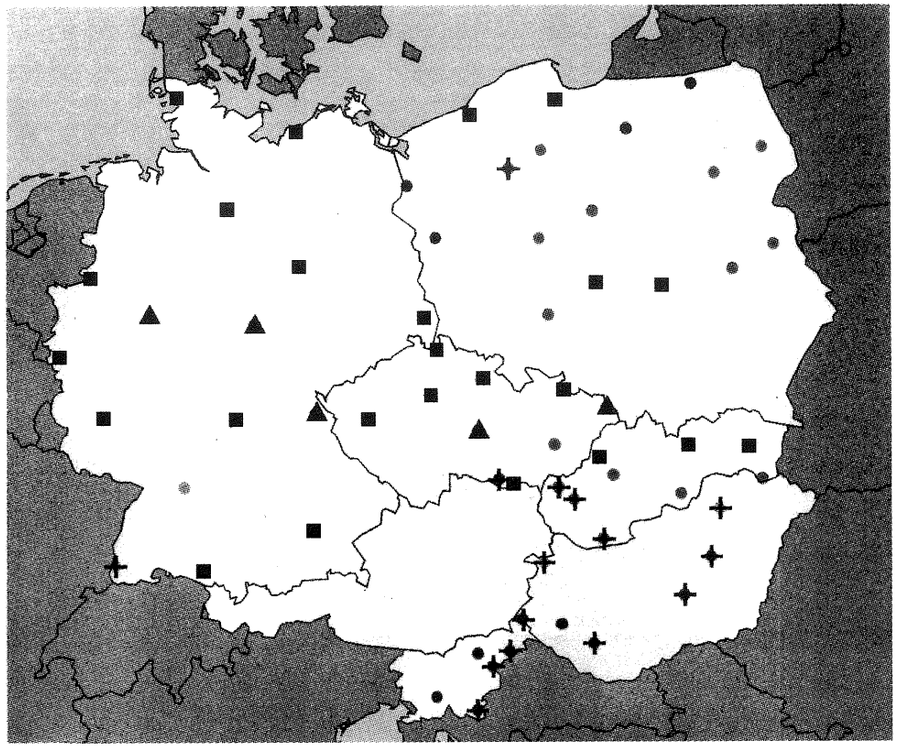

Figure 2: Project on phenology of CEC – phenophase *harvest of winter wheat* in the season 1995/96.

Legend:

- ▲ 28.08.- 14.09.
- ■ 10.08.-27.08.
- ● 26.07.-09.08.
- ✚ 09.07.-25.07.