COLLATION AND ANALYSIS OF REGULATORY FIELD TRIAL DATA FOR THE VALIDATION AND REFINEMENT OF CROP DEVELOPMENT DATES USED IN PESTICIDE EXPOSURE MODELLING AND RISK ASSESSMENT

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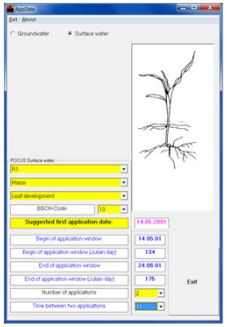
Background

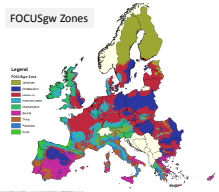
Determining appropriate pesticide application windows is an important component of surface water (SW) and groundwater (GW) pesticide exposure modelling; European regulators are increasingly constraining these application windows using estimates of the timing of BBCH crop growth stages from AppDate. The "repaired" version of the FOCUS SW models will have AppDate integrated directly into the software shell to remove "subjectivity" from the selection of application windows.

The AppDate (Klein, 2012; 2018) software calculates application dates for use in FOCUS SW and GW modelling with the purpose to align the product GAP being assessed with predefined model crops described by the FOCUS models. The dates for major crop development stages, *e.g*. BBCH 10, captured in AppDate are based on various sources, differentiated for GW and SW, with linear interpolation used for BBCH growth stages between these. While this consistency is welcome, given exposure assessments are a function of the application dates generated by this software, it is important to understand how realistic and representative they are. Although phenology datasets are available (*e.g.* http://www.pep725.eu/), there is currently no comprehensive, harmonised, quality-controlled, readily available, pan-European crop phenology dataset available to undertake such an assessment or for use in regulatory risk assessment refinement.



Methodology

The crop protection industry holds large quality-controlled datasets of the timing of BBCH crop growth stages within their efficacy and residue trials datasets that span the required crop types as well as the agronomic and pedoclimatic diversity of Europe, collected over several decades. Extraction and collation of a harmonised crop development dataset from such trials, held by individual companies, would allow for the justification of more realistic and location specific dates in regulatory risk assessment refinements. Such data have been used in the definition of country specific higher tier risk assessments (*e.g.* FROGS, 2011).



CropLife Europe have initiated and funded a 2-year project (2021 – 2022) to collate a crop development database for Europe, largely from product efficacy and residue field trials held by individual members, in order to meet this important regulatory requirement and further develop exposure science to allow for more accurate and realistic risk assessment.

The geographical extent will cover up to 32 countries including the EU27 as well as EEA countries (NO, LI, IS) plus Switzerland and the UK. Temporally there will be a focus on the most recent decades, given (i) there may be more data gaps the older the data is, (ii) scientific evidence suggests that cultivars have changed over time impacting crop phenology and (iii) climate change over that period may also have impacted crop phenology. The range of crops compiled will depend on data availability. Studies that can be geolocated to facilitate assignment to EPPO zone, Regulatory zone, Country and FOCUS scenario will be considered. The dates of pesticide application and efficacy/residue evaluation along with the accompanying BBCH growth stage of specific crops/crop groups recorded in the field trials will be extracted. A range of metrics to facilitate comparison with FOCUS/AppDate will be calculated *e.g.* descriptive statistics of the Julian day on which the reported BBCH growth stage/class was recorded in the trials.

Results

The results from this CropLife Europe funded project will comprise (i) a harmonised crop development database for Europe and (ii) an assessment of the comparability of AppDate application windows with the harmonised crop development dates. The database will also hold significant opportunities for future development of crop models to improve estimates and timing of exposure, not only in the context of exposure modelling, but also, for example, to help predict accurate timing of applications with respect to on and off-field weeds and non-target arthropods, especially bees.

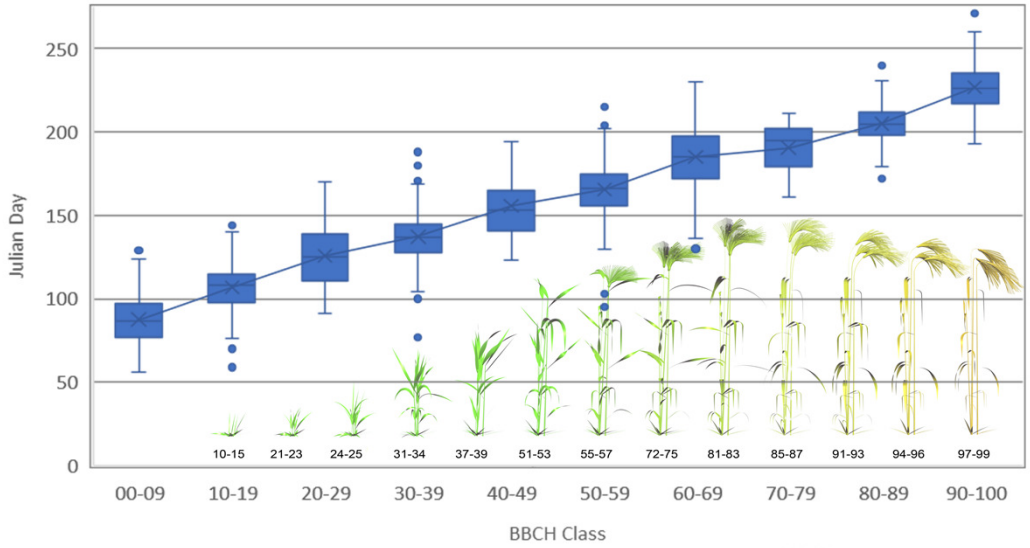


Figure 1: Infographic illustrating an example relationship between crop development and day of the year.

References:
1 Klein, M., 2012. Estimation of reasonable application dates dependent on BBCH crop development stages for PELMO (all FOCUS groundwater locations). Report Umweltbundesamt. Fraunhofer IME Schmallenberg. 30pp.
2 Klein, M., 2018. Estimation of consistent application dates dependent on BBCH crop development stages for FOCUS models. Fraunhofer IME Schmallenberg. 42pp.
3 FROGS, 2011. French Refinement Of Groundwater Scenarios" Report of the UIPP Environmental Methodology Working Group version 2.0, 314 pp.
4 Cereal growth stages image CC BY SA 4.0 - Kuester, T. and Spengler, D., 2018. Structural and Spectral Analysis of Cereal Canopy Reflectance and Reflectance Anisotropy. Remote Sensing 10(11):1767. https://doi.org/10.3390/rs10111767