CHAPTER 16

SWAT INPUT DATA: PEST.DAT

SWAT uses five databases to store information related to plant growth, urban land characteristics, tillage implements, fertilizer components and pesticide properties. The pesticide database contains parameters that govern pesticide fate and transport in the HRUs. Appendix A documents the source of parameter values in the database file provided with the model.

Following is a brief description of the variables in the pesticide/toxin database file. They are listed in the order they appear within the file.

Variable name	Definition
IPNUM	Pesticide/toxin number. IPNUM is the numeric code used in the management file to identify the pesticide/toxin to be applied. The different toxins in the pesticide database must have unique values for IPNUM. Required.
PNAME	Name of pesticide/toxin. (up to 17 characters allowed) Required.
SKOC	Soil adsorption coefficient normalized for soil organic carbon content (mg/kg)/(mg/L). Pesticide in the soil environment can be transported in solution or attached to sediment. The partitioning of a pesticide between the solution and soil phases is defined by the soil adsorption coefficient for the pesticide. The soil adsorption coefficient is the ratio of the pesticide concentration in the soil or solid phase to the pesticide concentration in the solution or liquid phase: $K_p = \frac{C_{solidphase}}{C_{solution}}$ where K_p is the soil adsorption coefficient ((mg/kg)/(mg/L) or m^3/ton), $C_{solidphase}$ is the concentration of the pesticide sorbed to the solid phase (mg chemical/kg solid material or g/ton), and $C_{solution}$ is the concentration of the pesticide in solution (mg chemical/L solution or g/ton). The definition of the soil adsorption coefficient in this equation assumes that the pesticide sorption process is linear with concentration and instantaneously reversible. Because the partitioning of pesticide is dependent upon the amount of organic material in the soil, the soil adsorption coefficient input to the model is normalized for soil organic carbon content. The relationship between the soil adsorption coefficient and the soil adsorption coefficient normalized for soil organic carbon content is: $K_p = K_{oc} \cdot \frac{orgC}{100}$

Variable name	Definition
SKOC, cont.	where K_p is the soil adsorption coefficient ((mg/kg)/(mg/L)), K_{oc} is the soil adsorption coefficient normalized for soil organic carbon content ((mg/kg)/(mg/L) or m^3/ton), and *orgC* is the percent organic carbon present in the soil. Required.
WOF	Wash-off fraction. The wash-off fraction quantifies the fraction of pesticide on the plant canopy that may be dislodged. The wash-off fraction is a function of the nature of the leaf surface, plant morphology, pesticide solubility, polarity of the pesticide molecule, formulation of the commercial product and timing and volume of the rainfall event. Required.
HLIFE_F	Degradation half-life of the chemical on the foliage (days). The half-life for a pesticide defines the number of days required for a given pesticide concentration to be reduced by one-half. The half-life entered for a pesticide is a lumped parameter that includes the net effect of volatilization, photolysis, hydrolysis, biological degradation and chemical reactions. For most pesticides, the foliar half-life is much less than the soil half-life due to enhanced volatilization and photodecomposition. If the foliar half-life is available for the pesticide this value should be used. If the foliar half-life is not available, the foliar half-life can be estimated using the following rules: 1) Foliar half-life is assumed to be less than the soil half-life by a factor of 0.5 to 0.25, depending on vapor pressure and sensitivity to photodegradation. 2) Foliar half-life is adjusted downward for pesticides with vapor pressures less than 10^{-5} mm Hg. 3) The maximum foliar half-life assigned is 30 days. Required.

Variable name	Definition
HLIFE_S	Degradation half-life of the chemical in the soil (days). The half-life for a pesticide defines the number of days required for a given pesticide concentration to be reduced by one-half. The soil half-life entered for a pesticide is a lumped parameter that includes the net effect of volatilization, photolysis, hydrolysis, biological degradation and chemical reactions. Required.
AP_EF	Application efficiency. The fraction of pesticide applied which is deposited on the foliage and soil surface (0.1-1.0). The remainder is lost. The application efficiency for all pesticides listed in the database is defaulted to 0.75. This variable is a calibration parameter. Required.
WSOL	Solubility of the chemical in water (mg/L or ppm) The water solubility value defines the highest concentration of pesticide that can be reached in the runoff and soil pore water. While this is an important characteristic, researchers have found that the soil adsorption coefficient, K_{oc}, tends to limit the amount of pesticide entering solution so that the maximum possible concentration of pesticide in solution is seldom reached. Reported solubility values are determined under laboratory conditions at a constant temperature, typically between 20°C and 30°C. Required.

The format of the pesticide/toxin database file is:

Variable name	Line #	Position	Format	F90 Format
IPNUM	ALL	space 1-3	integer	i3
PNAME	ALL	space 4-20	character	a17
SKOC	ALL	space 21-30	decimal(xxxxxxxx.x)	f10.1
WOF	ALL	space 31-35	decimal(xx.xx)	f5.2
HLIFE_F	ALL	space 36-43	decimal(xxxxxx.x)	f8.1
HLIFE_S	ALL	space 44-51	decimal(xxxxxx.x)	f8.1
AP_EF	ALL	space 52-56	decimal(xx.xx)	f5.2
WSOL	ALL	space 57-67	decimal(xxxxxxx.xxx)	f11.3