**Problems list for the version of the tri-trophic model from 04/05/2018**

1. Very few winged adults at the end of the season in comparison to the number of winged nymphs. They seem to die before having time to become adult. (This problem was already in the aphid-wheat sub-model.)

I have tried the survival function from Plantegenest et al. 2001 instead of the one form Duffy et al. 2017. It is less abrupt. Does not seem to change anything.

1. Too many aphids in such a small area (1m2)? The adults live too long or the fecundity is too high?
2. The transmission parameter rho: at first we put

Rho = 1- exp (-24\*transmission efficiency parameter (from Ardisson et al. 1993)\* number of sporulating cadavers).

However, the number of sporulating cadavers increases rapidly and then rho become a binary variable that turns to 1 when humidity is high enough. Therefore, I tried to add the number of susceptible aphid in order to use a kind of concentration parameter. Now rho is restricted between 0 and 0.15. Not perfect. We need to find something better.

1. The transmission efficiency parameter from Ardisson et al. 1993 was calculated under optimal conditions: 20oC and 95% RH with a disease pressure of 0.5 cadavers per aphid. Should we make it evolve according to environmental conditions?
2. Percentage of infected immigrants that is constant for now but should vary with the humidity probably. The immigration wave is constant also.
3. Do I really need a stage for the pre-adults? It complexifies the system and I am not sure it is important. We can maybe put a delay in the growth rate of the fecundity boxes instead?
4. The life fecundity of the infected adults and immigrants are arbitrary chosen so far. Have a look into the literature.
5. Do we need a resistant pool of aphid? There is no escaped aphids with a reduction in fecundity neither. Need to decide what to do.
6. So far, same probability of being infected for the nymphs, the apterous adults and winged.
7. The duration of:
   1. The disease for the winged adults (immigrants only for now) and the Stage duration of the immigrants
   2. The StageAndPhase of the cadavers (360DD might be too long)
   3. The StageAndPhase of the sporulating cadavers
8. We need data to calibrate and validate the model. Alternatively, we can let the unknown parameters variable, and study the range of the possibilities by filtering on the outputs (how it is supposed to be according to our knowledge). This way we still do not know the true parameters, but we know how variable they are and which limits they seem to have in our model. Then, we can discuss it from an ecological and epizootiological viewpoint.