CHANGES TO lme4

There have been several “Bug fixes” and “Major User” changes to lme4 since this webinar was presented. Some of these changes affect the output. For a review of changes in lme4 see: http://cran.r-project.org/web/packages/lme4/news.html

Among the “Major User” changes, the internal computational machinery has changed, and results estimated using newer versions of lme4 may not be numerically identical to those shown in this webinar. Because the model presented is well-defined (with one exception, see below), the results are very close.

The default optimizer used for lmer fits has been switched from "Nelder_Mead" to "bobyqa" because the lme4 developers have found this approach to be more reliable. To switch back to the old optimizer, use control=lmerControl(optimizer="Nelder_Mead")

The package lme4 now runs a series of numerical tuning checks for lmer and stops the run, issues errors or warnings. These options can be changed and the new non-default settings may be used to restore the speed and/or ability to fit a particular model without an error.
This last point is relevant to the model presented in the webinar. The model:

```
y  = lmer(BRIX~ (1|LINE) + (1|LOC) + (1|YEAR) + (1|REP%in%LOC:YEAR) + (1|LINE:LOC) + (1|LINE:YEAR))
```

was used to generate the variance components and to extract BLUPs for lines (different inbred lines, or varieties). However with newer versions of lme4 and newer core packages, the model leads to an error:

```
Error in checkNlevels(reTrms$flist, n = n, control):
grouping factors must have > 1 sampled level
```

This error occurs because the model is overparameterized; there is only one observation for every value of “REP%in%LOC:YEAR”. That means that estimating both var(residual) and var(REP%in%LOC:YEAR) can lead to spurious results (i.e. estimated solutions that represent a good fit, but are not necessarily reliable). There are at least two ways to enable estimation of variance components in this situation:

1) The problem can be avoided by altering the model and removing (1|REP%in%LOC:YEAR)) so that the model is not overparamterized.

```
y  = lmer(BRIX~ (1|LINE) + (1|LOC) + (1|YEAR) + (1|LINE:LOC) + (1|LINE:YEAR))
```

2) Alternatively, you can fit overparametrized models by using “lmerControl” to bypass the checks. We recommend that you ask for “warning” rather than “ignore”, in order to better evaluate whether your results are practical.

```
options(lmerControl=list(check.nobs.vs.rankZ = "warning",
      check.nobs.vs.nlev = "warning",
       check.nobs.vs.nRE = "warning",
      check.nlev.gtreq.5 = "warning",
      check.nlev.gtr.1 = "warning"))
brixvar_1 <- lmer(Brix~ (1|LINE) + (1|LOC) + (1|YEAR) + (1|LINE:LOC) + (1|LINE:YEAR) + (1|REP%in%LOC:YEAR))
summary(brixvar_1)
```