Simulation and planning the number of replicates

Muhammad Yaseen

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1 Abstract

Simulated data with known effects show how well an analysis recovers them, which is useful in teaching, and how often its tests detect effects of a given size, which is the basis for planning an experiment. `DiallelSim()` draws the data and `DiallelPower()` estimates the power of the combining-ability tests.

2 Simulation and the number of replicates

`DiallelSim()` draws plot data from Griffing's model with chosen standard deviations of the effects and returns the true effects with the data, so the estimates can be compared with the truth:

```
s <-
  DiallelSim(
      Parents = 6
    , Method  = 1
    , Rep     = 4
    , Env     = 1
    , Mean    = 100
    , gca     = 5
    , sca     = 3
    , rec     = 1
    , gcaEnv  = 0
```

```
    , scaEnv  = 0
    , EnvSD   = 0
    , Block   = 2
    , Error   = 4
    , seed    = 123
    )
fs <-
  Griffing(
      y          = y
    , Rep        = Rep
    , Cross1     = Cross1
    , Cross2     = Cross2
    , data       = s
    , Method     = 1
    , Model      = 1
    , Reciprocal = c("combined", "split")[1]
    )
round(x = cbind(true = attr(x = s, which = "truth")$gca, estimated =
 ↪  fs$GCA), digits = 2)
```

```
   true estimated
1 -5.04     -5.01
2 -3.39     -3.14
3  5.56      6.09
4 -1.88     -1.58
5 -1.59     -2.87
6  6.34      6.51
```

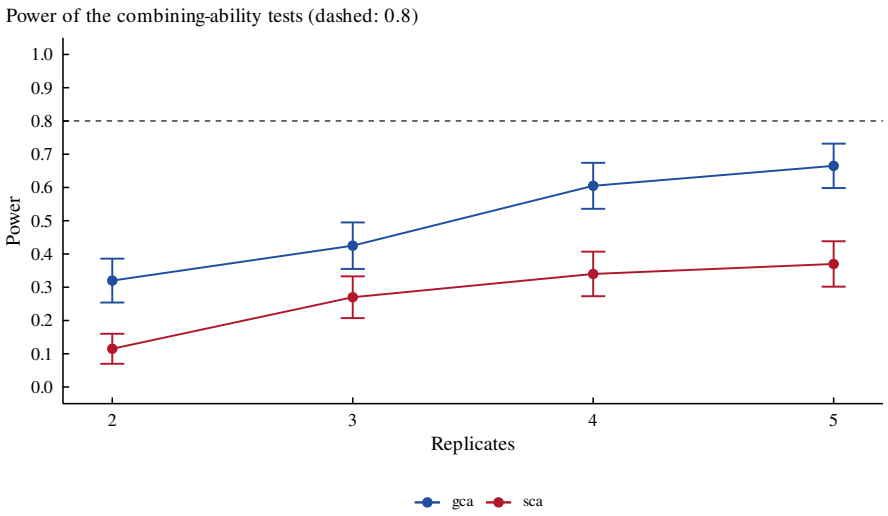
`DiallelPower()` repeats such simulations to estimate the power of the gca and sca tests for several numbers of replicates, which helps to plan an experiment:

```
pw <-
  DiallelPower(
      Parents = 6
    , Method  = 2
    , Rep     = 2:5
    , Model   = 1
    , gca     = 1
    , sca     = 1.5
    , rec     = 0
    , Error   = 4
    , nsim    = 200
    , alpha   = 0.05
    , seed    = 1
    )
pw
```

```
   Rep Source Power         SE
1:   2    gca 0.320 0.03298485
```

```
2:    2    sca 0.115 0.02255826
3:    3    gca 0.425 0.03495533
4:    3    sca 0.270 0.03139267
5:    4    gca 0.605 0.03456696
6:    4    sca 0.340 0.03349627
7:    5    gca 0.665 0.03337477
8:    5    sca 0.370 0.03413942
```

```
plot(x = pw)
```



3 Summary

`DiallelSim()` gives data with known effects for teaching and checking; `DiallelPower()` shows how many replicates detect gca and sca effects of a given size.

4 References

Griffing, B. (1956). Concept of general and specific combining ability in relation to diallel crossing systems. *Australian Journal of Biological Sciences*, 9(4), 463–493.