Heritability Problems

Ethology and Behavioral Ecology

Suppose that a population of bees is being studied in terms of the rate at which they obtain nectar (their "loading rate") while visiting a number of artificial "standard flowers". The standard flower is made of plastic that always contains the same amount of sugar water in the same concentration.
A species of solitary bees are used (not honeybees -- they are social).
Individual female bees are identified by bar codes glued to their thorax -- a scanner activates a computer and records how long they visit the flower and how much nectar they take.
From this, a rate of nectar uptake (loading rate) can be calculated. It is found that loading rates range from **3 μl/s** (microliters per second) to **10 μl/s** with a mean value of **5 μl/s** (the data are not normally distributed).

Suppose that a group of bees that gather nectar at an average of **9.5 μl/s** are allowed to breed and their offspring's (the F_1) visit times are scored and found to range from 4.2 to 11.3 μl/s with a mean of **8.7 μl/s**.

Find:

- Selection differential
- Selection response
- h^2
- V_P for the parents (trick question designed to see if you understand V_p)

Given the value of h^2 you calculated, are you surprised that there was a large range of loading rates in the P and F_1?

Would you expect similar loading rates for this population in a different environment? If the loading rates change, does that necessarily mean that the heritability has changed? EXPLAIN your answers.