EGG SIZE INCREASES WITH MATERNAL AGE IN LEEK ASSOCIATED THELYTOKOUS (L2) *THRIPS TABACI* LINEAGE

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INTRODUCTION

Maternal age influences the egg size of many species of insects. In some insect species, egg size decreases with increasing maternal age (Fox, 1993), while in some others, egg size increases with increasing maternal age (Kasule, 1991), moreover, egg size being independent of maternal age has also been reported (Berger, 1989; Marshall, 1990). The change in egg size with regards to maternal age in sexual reproduction is indirectly attributed to the female nutritional status and nuptial gifts that females receive during mating. But in asexual reproduction, females do not receive nuptial gifts and the effect of maternal age on egg size is unclear. Recent studies confirmed that *Thrips tabaci* is a cryptic species complex and it has been divided into three lineages: leek associated arrhenotokous (L1), leek associated thelytokous (L2) and tobacco associated arrhenotokus (T) lineages (Brunner et al, 2004). The most common reproductive mode is thelytoky, a parthenogenesis in which females are produced from unfertilized eggs (Lewis, 1973). Here we evaluated the effect of maternal age on egg size in L2 lineage of *T. tabaci*.

MATERIAL AND METHODSD

For measuring the egg size in the L2 lineage of *T. tabaci*, 23 pupae were collected from the stock colonies and were reared in 2 ml Eppendorf tubes individually on bean (*Phaseolous vulgaris* L) leaf disks less than 1 cm in diameter until female emergence. Pupae were observed every twelve hours and time of female emergence was recorded. Experiment was performed in a growth chamber with controlled conditions at constant 23ºC with light and dark photoperiod regime of L18:D8 hours. After reaching the adult stage females were transferred to a new leaf bean disk for oviposition throughout their lifespan and bean disks were changed every twelve hours until the females died. Eggs laid into the bean leaf disks were excavated carefully with a needle under stereomicroscope and they were placed on a microscope slide under calibrated compound microscope. Two dimension of an egg (width and length) were measured under 600x magnification. A total of 889 eggs following the measurements were placed back into a tube carefully with a help of a needle, each egg was placed individually on a bean leaf disk to facilitate hatching and consequent juvenile development. Eggs were characterized by a Mother ID, mother age, time of oviposition and hatching date. Egg volume was calculated using the formula from (Church et al, 2019) $V=width*thickness*width*\pi/6 = width^2*length*\pi/6$.

Using the formula, the volumes were calculated from two measured dimensions, namely length and width assuming that thickness and width are the same.

RESULTS AND DISSCUSSION

To test the maternal age effect on egg size, we used linear regression models. Egg volume trends were tested for female age 1-10 days and above 10 days separately, too, in order to evaluate the egg size dependence on maternal age in their young and old adult phases. We have found that in the L2 lineage, maternal age significantly influenced the egg size. The slopes of linear trends of egg size depending on mother's age, starting from day 2 to a moving end point, are all positives and highly significant $p<0.001$, the trends are all increasing (Figure 1). The range of slopes is going from 40671.04 to 6603.41 (Figure 3). Although they are all positive and significant, the slopes are decreasing linearly. And the slopes calculated from day 11 and further up to day 20 (i.e 11-20, 12-20, 13-20 etc.) are around a constant (~8000) ranging from 9126.77 to 6603.41. And the linearly decreasing slope pattern up to day 10 and the around constant pattern of it later are very well-separable (i.e the change from linear decrease to almost no change is sudden). The slopes of linear trends of egg sizes depending on mother's age, starting from a moving point day 5 or later to fixed end point day 20 are increasing to day 9, but the slopes are significant only in 5 cases (2-8; 2-8.5; 2-9; 2-9.5; 2-10) coloured in red); these significant results, however, can be caused by some low egg sizes (circled). So, we ought not to evaluate these trends as significant. The day 10 as a cut point, however, does exist but after this age the positive linear trend does not change notably as it did before day 10.

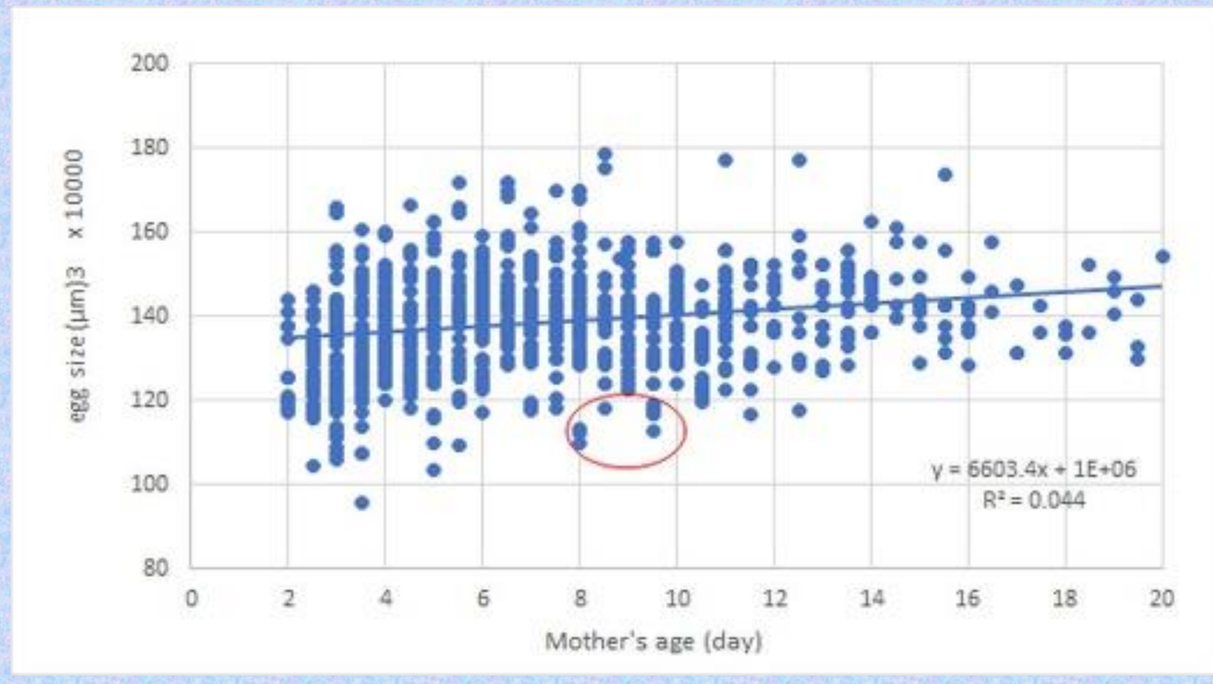

Fig.1. Linear regression of egg size throughout the lifespan of females

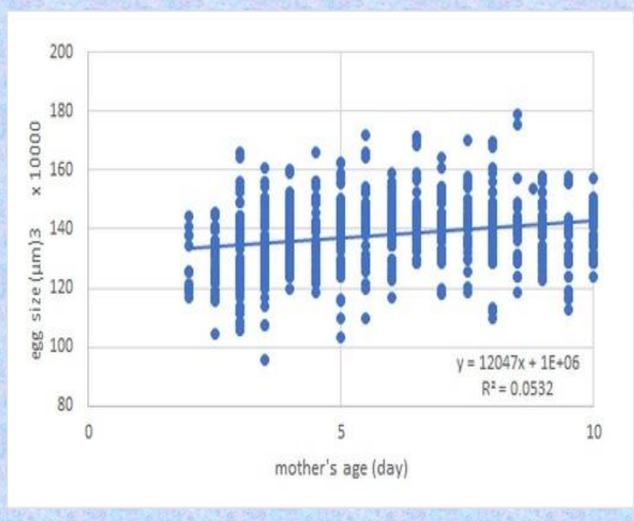

Fig.2. Linear regression of egg size in the female age interval 1-10 days

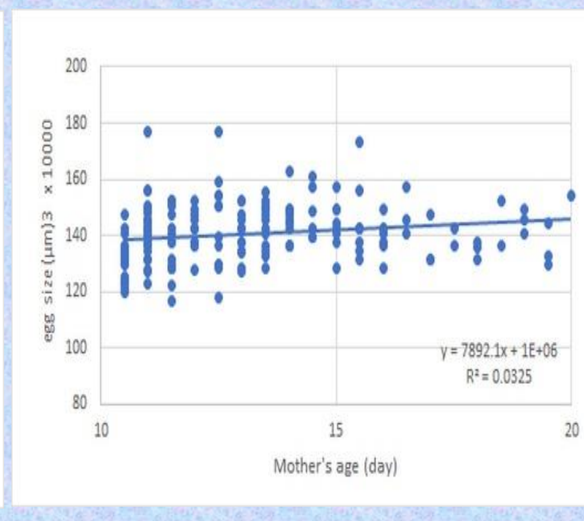

Fig.3. Linear regression of egg size in the female age interval above 10 days.

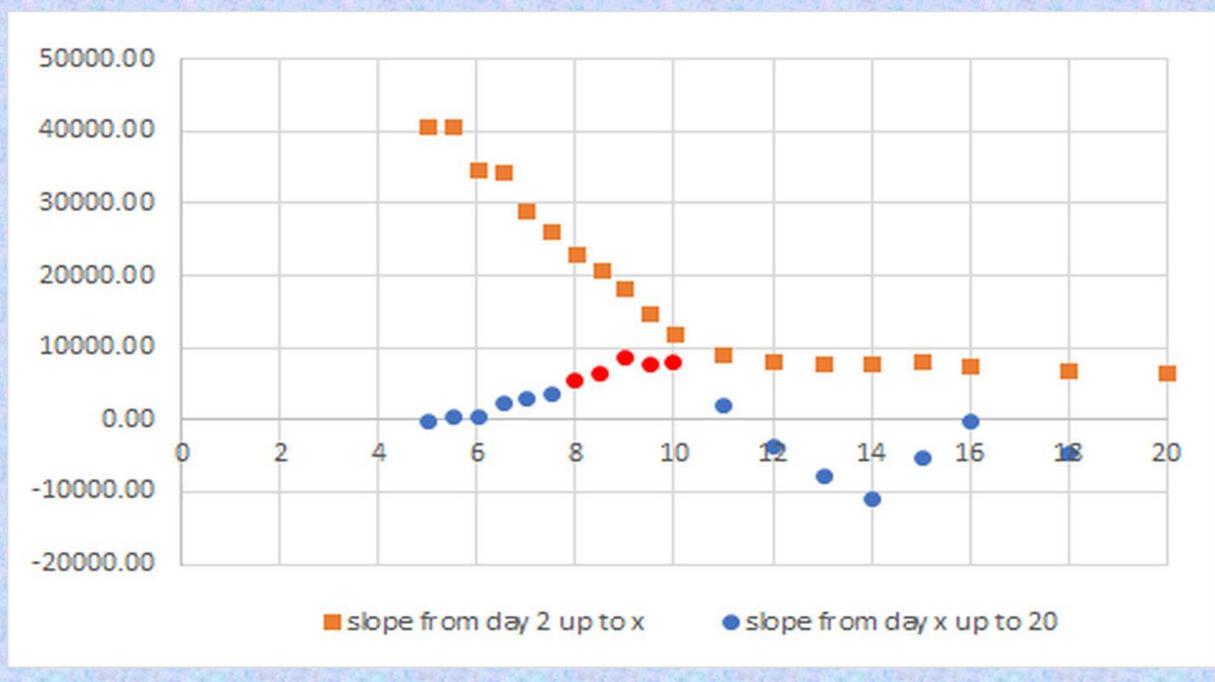

Fig.4. Slopes of linear regression models with egg size explained by mother's age

CONCLUSION

Overall, we can conclude that in case of L2 lineage of *T. tabaci* egg size were linearly increasing with growing maternal age, but the *rate* of dependence (i.e., the slope of the trend) was decreasing up to day 10 and thereafter it did not change notably.

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