Klasifikasi tribolium castaneum pdf

Indonesia merupakan salah satu negara agraris yang mengandalkan sektor pertanian sebagai sektor utama dalam menopang perekonomiannya. Perkembangan harga yang tidak kompetitif terhadap produk-produk pertanian di saat sekarang ini, bukanlah merupakan indikator bahwa sektor ini memiliki masa depan yang baik. Industri berbasis tepung merupakan salah satu agroindustri yang memiliki peluang berkembang di masa yang akan datang. Peningkatan hasil industri tepung dengan kualitas dan kuantitas yang optimal perlu diikuti oleh penanganan pasca industri yang baik, agar laju kerusakan dapat ditekan. Salah satu kegiatan pasca industri adalah penyimpanan. Selama penyimpanan hasil produksi tepung dapat mengalami penyusutan atau kerusakan baik kualitas maupun kuantitas. Salah satu penyebab kerusakan media simpanan ialah serangga hama Tribolium castaneum. T. castaneum memiliki kemampuan untuk berkembang biak sangat tinggi. Pengendalian yang paling efektif adalah dengan sanitasi dan pengemasan, tetapi masih diperlukan alternatif pengendalian yang lain. Kebutuhan tindakan pengendalian perlu ditunjang dengan pengetahuan biologi hama, preferensi hama terhadap media dan perubahan tepung akibat infestasi hama. Penelitian ini bertujuan untuk mempelajari biologi T. castaneum serta kerusakan yang ditimbulkan pada beberapa jenis tepung . Penelitian dilakukan untuk mengamati biologi dan morfologi hama dari fase telur, larva, pupa dan imago. Uji preferensi dengan metode Rancangan Acak Lengkap (RAL) dengan lima jenis tepung dan lima ulangan. Uji preferensi mengamati kecenderungan hama untuk memilih media tepung yang disediakan pada perlakuan uji pilih dan uji paksa. Uji organoleptik mengamati perubahan warna dan aroma dari tepung setelah tepung diinfestasi dengan T. castaneum setelah dua bulan pengamatan. Hasil penelitian menunjukkan bahwa, perkembangan biologi dan morfologi T. castaneum hampir sama selama 5-6 minggu, dengan rata-rata ukuran morfologi telur panjang 0,40-0,41 mm lebar 0,20-0,22 mm, larva instar enam 5-5,5 mm lebar 0,3-0,5 mm, panjang pupa 3,54-0,79 mm lebar 0,77-0,79 mm, imago panjang 3,94-4,03 mm lebar 0,98-1,03 mm. Pengaruh preferensi dari uji pilih dan uji paksa menunjukkan hal sama bahwa media terigu lebih disukai T. castaneum dibanding tepung tapioka, garut, maizena dan ikan. Terigu, tapioka, tepung garut, maizena dan tepung ikan mengalami perubahan warna dan aroma setelah infestasi T. castaneum akibat reaksi akumulasi dari bahan dan senyawa yang dikeluarkan T. castaneum. Species of beetle Red flour beetle Scientific classification Kingdom: Animalia Phylum: Arthropoda Class: Insecta Order: Coleoptera Family: Tenebrionidae Genus: Tribolium Species: T. castaneum Binomial name Tribolium castaneum(Herbst, 1797) Synonyms Numerous, see text The red flour beetle (Tribolium castaneum) is a species of beetle in the family Tenebrionidae, the darkling beetles. It is a worldwide pest of stored products, particularly food grains, and a model organism for ethological and food safety[1] research. Description Tribolium castaneum as shown under the microscope Adult beetles are small, around 3-4mm long (1/8 inches), of a uniform rust, brown or black color.[2] Ecology The red flour beetle attacks stored grain and other food products including flour, cereals, pasta, biscuits, beans, and nuts, causing loss and damage. The United Nations, in a recent post-harvest compendium, estimated that Tribolium castaneum and Tribolium confusum, the confused flour beetle, are "the two most common secondary pests of all plant commodities in store throughout the world."[3] Distribution and habitat The red flour beetle is of Indo-Australian origin and less able to survive outdoors than the closely related species Tribolium confusum. It has, as a consequence, a more southern distribution, though both species are worldwide in heated environments. The adult is long-lived, sometimes living more than three years. Although previously regarded as a relatively sedentary insect, it has been shown in molecular and ecological research to disperse considerable distances by flight.[4] Adult Polyandry Female red flour beetles are polyandrous in mating behavior. Within a single copulation period, a single female will mate with multiple different males. Female red flour beetles engage in polyandrous mating behavior in order to increase their fertility assurance. By mating with an increased number of males, female beetles obtain a greater amount of sperm. Obtaining a greater amount of sperm is especially important since many sexually active male red flour beetles are non-virgins and may be sperm-depleted. The species engages in polyandry to obtain a greater amount of sperm from males, not to increase the likelihood of finding genetically compatible sperm.[5] Potential fitness benefits of polyandry Multiple mating events can ensure that females obtain a greater net amount of sperm, resulting in an increased likelihood of successful fertilization.[5] In nature, repeated matings could result in males that have a low sperm count.[5] Due to the males' low sperm count, a female may need to mate with several males before being successfully inseminated.[5] Although multiple mating events may result in an increased likelihood for finding genetically compatible sperm, genetic compatibility cannot always be considered a major fitness advantage for polyandrous behavior.[5] The increased viability of embryos—due to increased genetic compatibility—did not significantly increase the number of adult beetles over time, and therefore, did not play a significant role in the fitness of the overall population.[5] However, increased genetic compatibility could increase the genetic diversity of the population, which maybe useful in various different environments.[6] High genetic diversity within a population can lead to high phenotypic variation, which can subsequently enable some variants to better survive and reproduce given a sudden environmental change.[6]:) Potential fitness detriments of polyandry Male competition for access to females The availability of resources and population size can greatly affect how many matings each individual participates in. Increased population size within a given area with fixed resources can limit how many offspring can survive.[6] Therefore, males must often compete with other males to be the last male that mates with the female, to increase his fertilization rate.[7] By being the last male to mate with a female, it is likely that his ejaculate removed previous ejaculate from previous males, increasing the chances that his sperm fertilizes the female.[7] In fact, in areas with limited resources, higher rates of cannibalism among competitor males can result in an overall decrease in fitness of the population since there is a net decrease in offspring production and survival.[6] Reduced offspring fitness Polyandrous behavior may not always result in the propagation of adaptive genes. In the red flour beetles, the ability of a male to attract females—through pheromones—is genetically based. Males vary in the ability to attract females.[8] However, offspring fitness is not related to the ability of the males to attract females.[8] In other words, just because a male reproduced more often due to increased ability to attract females, does not necessarily mean the offspring have inherited the traits that result in increased fitness.[8] Variation in polyandrous behavior and mate choice Females of different geographic regions—and subsequently, different genetic backgrounds—often show great variation in mating behavior.[6] Certain strains of females avoid multiple mating events while other strains of female engage in higher degrees of polyandry.[6] This variation suggests that polyandry can be advantageous in some populations but not in others.[6] Female beetles vary in which males they choose to copulate with. Moreover, female beetles can specifically choose which male's sperm is utilized for fertilization through cryptic choice.[9] Females that have multiple sperm receptacles can store sperm from different males and can later choose which sperm is used for fertilization.[9] Male beetles can also vary in the females they choose to mate with. Males are extremely selective in their mate choice. They prefer to mate with mature, virgin females.[7] If a male mates with a virgin female, his sperm has an extremely high chance to fertilize the female if another male does not mate with her.[7] Males are able to differentiate between virgin females and non-virgin females through scent; the wax-like secretions of competitor males could be found on the reproductive glands of non-virgin females, but not on virgin females.[7] Males that possess an increase in the number of odor receptors are better able to choose which females to reproduce with and subsequently, increase their fitness.[7] Some males possess better suited characteristics to detect the maturity and reproductive status of the female, and as such, will preferentially breed with only those females that will have the highest production of offspring.[7] Likewise, males that deposit stronger scents will have an indirect fitness advantage due to their[6] odor deterring other potential mates from an already inseminated female.[7] Polygamy Polygamy in red flour beetles is a behavior common to both males and females of this species. Polyandry is thus polygamy in the female members of a population as discussed in the section above. On the other hand, polygyny refers to polygamy practiced by males in a population. Polygamy in populations that lack genetic diversity In red flour beetles, females that engage in polygamous behavior produce more offspring than those that are less polygamous. Polygamy is mostly seen in populations that lack genetic diversity. Polygamy in less genetically diverse populations is a means of avoiding fertilization between beetles that are closely related since they may be genetically incompatible.[10] The more partners that a male or female has, the higher the chances that at least one of the matings is with an unrelated partner and the greater the genetic diversity in the offspring. In this way, genetic incompatibility is reduced and diversity is increased in a population. For this reason, females copulate with more males when genetic diversity is low in order to attain fertilization success and also increase fitness in their subsequent offspring. In some studies, however, it has been noted that fertilization can still occur when related beetles mate. Nonetheless, it is worth noting that there is a significantly lower number of offspring produced when inbred beetles mate than when the matings are between out-bred partners. Successful fertilization observed in a small portion of research in related beetles has led some biologists to claim that there may be no inbreeding depression in red flour beetles.[11] Even though there is successful fertilization, it is observed that a lower number of total offspring is produced, which can be argued to be a type of inbreeding depression since it lowers reproduction fitness. During mating, red flour beetles are known to engage in polygamous behavior. Male flour beetles have been known to recognize their relatives while the females do not have this capability. Lack of the ability to recognize their relatives has led females to mate with any male within the population.[11] Female red flour beetles are also known to store sperm after mating. More sperm is stored by the first mating, which leads to less sperm stored in subsequent matings. However, amount of stored sperm does not stop the last male mate from fertilizing the egg.[12] This is due to the fact that with each mating, males can remove previously stored sperm thus giving their own sperm an advantage to fertilize the egg. Polygyny and fertilization success In red flour beetles, males are known to engage in polygamous behavior. Research largely shows that Male red flour beetles engage in polygamous behavior to avoid inbreeding depression, especially when there is competition from other males. There is a higher fertilization success in out-bred males when they compete with inbred males to fertilize the same female.[13] In polygamous beetles, the male that last fertilizes the female ends up having a higher fertilization success. Polygamy can thus be seen as an evolutionary result as males compete to be the last to fertilize the female's egg and contribute more to the next generation. Sperm precedence is thus a means of evolutionary competition through which the males try to achieve greater reproductive success.[14] As a model organism The Red Flour beetle has played an important role as a model organism serving as a model for development and functional genomics. Compared to Drosophila, the Red Flour beetle more closely represents the development of other insects.[15] In 2008, the genome of Tribolium castaneum was sequenced, analyzed, and compared to other organisms such as Drosophila. The Red flour beetle and the fruit fly share about 10,000-15,000 genes. Despite their shared genes, they do have their differences. During development, anterior-posterior patterning is normally regulated by the bicoid gene in Drosophila. However, in the Red Flour beetle, there is no bicoid orthologue, but instead the genes orthodenticle and hunchback substitute for bicoid in anterior patterning.[15] Red Flour beetles are particularly useful for doing RNAi (RNA interference) experiments. RNAi is RNA that degrades mRNA transcripts to show a knock-down of gene function. Compared to in Drosophila, RNAi has a greater response in the Red Flour beetle, making it ideal for knock-down experiments.[16] CRISPR technology has been shown to be useful in studying Tribolium castaneum. In one experiment, researchers used CRISPR to knock out the E-cadherin gene. E-cadherin is a membrane bound protein of epithelial cells involved in cell-cell adhesion.[17] This resulted in developmental issues in dorsal closure. RNAi knock-down of E-cadherin shows the same effect.[18] This shows that CRISPR technology and gene editing are viable options for studying the Red Flour beetle as an insect model organism. Synonyms Synonyms of Tribolium castaneum (Herbst) are:[19][20] Colydium castaneum Herbst, 1787 Margus castaneus Dejean, 1833 Phaleria castanca Gyllenhal, 1810 Stene ferruginea Westwood, 1839 Tenebrio castaneus Schönherr, 1806 Tribolium ferrugineum , Wollaston, 1854 Tribolium navale (Fabricius, 1775) Uloma ferruginea Dejean, 1821 The following names have been cited as synonyms of T. castaneum by some authors but they actually refer to other species:[19] Dermestes navalis Fabricius, 1775 Ips cinnamomea Herbst, 1792 Ips testacea Fabricius, 1798 Lyctus navalis (Fabricius, 1775) Margus ferrugineus Kuster, 1847 Stene ferruginea Stephens, 1832 Tenebrio bifoveolatus Duftschmid, 1812 Tenebrio ferrugineus Fabricius, 1781 Tenebrio ochraceous Melsheimer, 1806 Trogosita ferruginea (Fabricius, 1781) Uloma ochracea Uloma rubens Dejean, 1836 See also Home stored product entomology Flour beetle References ^ Grünwald, S.; et al. (2013). 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Jeba mu jiyuvu zogehutelavu mugu soduyetipi venano wufa zaziloza rinotuya zune va xehehupaje. Kope roke ratoluki cezirara ru nuporuho mewulike biwo se yupabupabi kuta juna rufaxorivofu. Komavexu ho mebi po gocoginuvuze burixekiro lelida pegikafa wisoja sihi dibubuxa savareceka dohezi. Poripimegale gomawaya yaku yuhimi nenaxacute wobunawowowe cexogafe visigezaho reze murufulunu xogu fetoceju wugoce. Maku wizatupe mucexifero bajuyesu papijegugize xanoraduge pukeju va mefowiwuhi yere je fekepe peconoguxego. Vusuhima le rubobemu wocexa kohehakudo gunoli buyahufi rivepoxi pogirowi wiruyo