



## DAFTAR PUSTAKA

- Abbott, W. S. 1987. A method of computing the effectiveness of an insecticide. *Journal of Mosquito Control Association*. 3(2): 302-303.
- Akpapunam, M. A., dan Sefa-Dedeh, S. 1997. Jack bean (*Canavalia ensiformis*): Nutrition related aspects and needed nutrition research. *Plant foods for human nutrition*. 50(2): 93-99.
- Alves, R. T., Bateman R. P., Prior, C., dan Leather, S. R. 1998. Effects of simulated solar radiation on conidial germination of *Metarhizium anisopliae* in different formulations. *Crop Prot.* 17(8):675–679.
- Alvianingsih, Y., Pramudi, M. I., dan Fitriyanti, D. 2020. Efektivitas rendaman kulit bawang merah terhadap hama daun tomat pada masa vegetatif. *Proteksi Tanaman Tropika*. 3(2): 200-203.
- Al-Zubaidi, F. S., dan Capinera, J. L. 1983. Application of different nitrogen levels to the host plant and cannibalistic behavior of beet armyworm, *Spodoptera exigua* (Hübner) (Lepidoptera: Noctuidae). *Environmental entomology*. 12(6): 1687-1689.
- Anand, R., dan Tiwary, B. N. 2009. Pathogenicity of entomopathogenic fungi to eggs and larvae of *Spodoptera litura*, the common cutworm. *Biocontrol Science and Technology*. 19(9): 919-929.
- Anwar, W., Javed, M. A., Shahid, A. A., Nawaz, K., Akhter, A., Ur Rehman, M. Z., ... dan Haider, M. S. 2019. Chitinase genes from *Metarhizium anisopliae* for the control of whitefly in cotton. *Royal Society open science*. 6(8): 190412.
- Aramwit, P., Kanokpanont, S., Nakpheng, T., dan Srichana, T. 2010. The effect of sericin from various extraction methods on cell viability and collagen production. *International Journal of Molecular Sciences*. 11(5): 2203.
- Athanassiou, C. G., dan T. Steenberg. 2007. Insecticidal effect of *Beauveria bassiana* (Balsamo) Vuillemin (Ascomycota: Hypocreales) in combination with three diatomaceous earth formulations against *Sitophilus granarius*(L.) (Coleoptera: Curculionidae). *Biol. Control*. 40: 411–416.
- Athanassiou, C. G., Kavallieratos, N. G., Rumbos, C. I., dan Kontodimas, D. C. 2017. Influence of temperature and relative humidity on the insecticidal efficacy of *Metarhizium anisopliae* against larvae of *Ephestia kuehniella* (Lepidoptera: Pyralidae) on wheat. *Journal of insect science*. 17(1).



- Aw, K. M. S., dan Hue, S. M. 2017. Mode of Infection of *Metarhizium* spp. Fungus and Their Potential as Biological Control Agents. *Journal of Fungi*. 3(2).
- Awan, A. 2007. *Domestikasi ulat sutera liar Attacus atlas (Lepidoptera: Saturniidae) dalam usaha meningkatkan persuteraan nasional*. Disertasi. Bogor. Program Studi Sains Veteriner. Sekolah Pasca Sarjana. Fakultas Kedokteran Hewan. Institut Pertanian Bogor. Hal: 48-49.
- Bakti, D., dan Tobing, M. C. 2018. Preference *Spodoptera litura* (Lepidoptera: Noctuidae) on Leguminose, oil palm of peat land and mineral. In *Journal of Physics: Conference Series*. 1116(5): 052046
- Bich, G. A., Castrillo, M. L., Kramer, F. L., Villalba, L. L., dan Zapata, P. D. 2021. Morphological and molecular identification of entomopathogenic fungi from agricultural and forestry crops. *Floram Floresta e Ambiente*. 28(2): e20180086.
- Bidochka, M. J., Kampm A. M., Lavender, T. M., Dekoning, J., dan De Croos, J. N. A. 2001. Habitat association in two genetic groups of the insectpathogenic fungus *Metarhizium anisopliae*: uncovering cryptic species?. *Applied and Environmental Microbiology*. 67(3): 1335-1342.
- Boggs, C.L., 2009. Understanding insect life histories and senescence through a resource allocation lens. *Functional Ecology*. 23: 27–37.
- Braga, G. U. L., Flint, S. D., Messias, C. L., Anderson, A. J., dan Roberts, D. W. 2001. Effect of UV-B on conidia and germlings of the entomopathogenic hyphomycete *Metarhizium anisopliae*. *Mycological Research*. 105(7): 874–882.
- Bragard, C., EFSA PLH Panel (EFSA Panel on Plant Health)., Dehnen-Schmutz, K., Di Serio, F., Gonthier, P., Jacques, M-A., Jaques Miret, J. A., Justesen, A. F., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Thulke, H-H., Van der Werf, W., Vicent Civera, A., Yuen, J., Zappalà, L., Malumphy, C., Czwienckez, E., dan MacLeod, A. 2019. Scientific Opinion on the pest categorisation of *Spodoptera litura*. *EFSA Journal*. 17(7): 5765.
- Budi, A. S., Afandhi, A., dan Puspitarini, R. D. 2013. PATOGENISITAS JAMUR ENTOMOPATOGEN *Beauveria bassiana* Balsamo (DEUTEROMYCETES: MONILIALES) PADA LARVA *Spodoptera litura* Fabricius (LEPIDOPTERA: NOCTUIDAE). *Hama dan Penyakit Tumbuhan*. 1(1): 58.
- Bunghong, C., dan Sirithon, S. 2021. Changes in amino acid profiles and bioactive compounds of thai silk cocoons as affected by water extraction. *Molecules*. 26(7): 2033.



- Capar, G., Aygun, S. S., dan Gecit, M. R. 2009. Separation of sericin from fatty acids towards its recovery from silk degumming wastewaters. *Journal of Membrane Science*. 342(1-2): 179-189.
- Chapman, J. W., Williams, T., Escribano, A., Caballero, P., Cave, R. D., dan Goulson, D. 1999. Age-related cannibalism and horizontal transmission of a nuclear polyhedrosis virus in larval *Spodoptera frugiperda*. *Ecological Entomology*. 24(3): 268-275.
- Chen, F., Porter, D., dan Vollrath, F. 2012. Morphology and structure of silkworm cocoons. *Materials Science and Engineering: C*. 32(4): 772–778.
- Chen, M. M., Li, Y., Chen, M., Wang, H., Li, Q., Xia, R. X., ... dan Qin, L. 2014. Complete mitochondrial genome of the atlas moth, *Attacus atlas* (Lepidoptera: Saturniidae) and the phylogenetic relationship of Saturniidae species. *Gene*. 545(1): 95–101.
- Costa, F., Silva, R., dan Boccaccini, A. R. 2018. Fibrous protein-based biomaterials (silk, keratin, elastin, and resilin proteins) for tissue regeneration and repair. *Peptides and Proteins as Biomaterials for Tissue Regeneration and Repair*. 175–204.
- Craig, C. L., Weber, R. S., dan Akai, H. 2012. Wild silk: wild silk enterprise programs to alleviate poverty and protect habitats. *Handbook of Natural Fibres*. 576–604.
- De França, S. M., Breda, M. O., Barbosa, D. R., Araujo, A. M., dan Guedes, C. A. 2017. The sublethal effects of insecticides in insects. *Biological control of pest and vector insects*. 23-39.
- Desmawita, B. K., Fuah, A. M., dan Ekastuti, D. R. 2013. Intensification of Wild Silkworm *Attacus atlas* Rearing (Lepidoptera: Saturniidae). *Media Peternakan*. 36(3): 159.
- Di, X. Y., Yan, B., Wu, C. X., Yu, X. F., Liu, J. F., dan Yang, M. F. 2021. Does larval rearing diet lead to premating isolation in *Spodoptera litura* (Fabricius) (Lepidoptera: Noctuidae)??. *Insects*. 12: 1-15.
- Du, X., Li, J., dan Chen, Y. 2011. Proteomic analysis of sericin in *Bombyx mori* cocoons. *Biotechnology and Bioprocess Engineering*. 16(3): 438–444.
- El Chamy, L., Leclerc, V., Caldelari, I., dan Reichhart, J. M. 2008. Sensing of 'danger signals' and pathogen-associated molecular patterns defines binary signaling pathways upstream of Toll. *Nature immunology*. 9(10): 1165-1170.
- Eleftherianos, I., Gökçen, F., Felföldi, G., Millichap, P. J., Trenczek, T. E., Ffrench-Constant, R. H., dan Reynolds, S. E. 2007. The immunoglobulin



- family protein Hemolin mediates cellular immune responses to bacteria in the insect *Manduca sexta*. *Cellular microbiology*. 9(5): 1137-1147.
- Emanuele, E., Bertona, M., Sanchis-Gomar, F., Pareja-Galeano, H., dan Lucia, A. 2014. Protective effect of trehalose-loaded liposomes against UVB-induced photodamage in human keratinocytes. *Biomedical reports*. 2(5): 755-759.
- Endrawati, Y. C. 2012. *Ekstraksi Protein Serisin dari Kokon Sutera Liar Attacus atlas dan Karakterisasinya sebagai Biomaterial*. Tesis. Sekolah Pascasarjana, Institut Pertanian Bogor: Bogor. Hal: 38-39.
- Fand, B. B., Sul, N. T., Bal, S. K., dan Minhas, P. S. 2015. Temperature impacts the development and survival of common cutworm (*Spodoptera litura*): simulation and visualization of potential population growth in India under warmer temperatures through life cycle modelling and spatial mapping. *PLoS One*. 10(4): e0124682.
- Fang, W., Fernandes, É. K. K., Roberts, D. W., Bidochka, M. J., dan St. Leger, R. J. 2010. A laccase exclusively expressed by *Metarhizium anisopliae* during isotropic growth is involved in pigmentation, tolerance to abiotic stresses and virulence. *Fungal Genetics and Biology*. 47(7): 602–607.
- Fattah, A., dan Hamka. 2012. The main level of soybean pest attack Tr., Sucker *Riptortus linear* (L) and armyworm of *S. litura* F. In: South Sulawesi. *Proceedings National Seminar on Specific Agricultural Technology Innovation Location. BOOK I*, Indonesian Agency for Agricultural Research and Development. 436-440.
- Fegan, M., Manners, J. M., Maclean, D. J., Irwin, J. A. G., Samuels, K. D. Z., Holdom, D. G., dan Li, D. P. 1993. Random amplified polymorphic DNA markers reveal a high degree of genetic diversity in the entomopathogenic fungus *Metarhizium anisopliae* var. *anisopliae*. *Microbiology*. 139(9): 2075-2081.
- Fellers, C. R. 1916. The analysis, purification and some chemical properties of agar agar. *Industrial & Engineering Chemistry*. 8(12): 1128-1133.
- Feng, P., Ding, H., Lin, H., dan Chen, W. 2017. AOD: the antioxidant protein database. *Scientific Reports*. 7(1).
- Fernandes, É. K. K., Rangel, D. E. N., Braga, G. U. L., dan Roberts, D. W. 2015. Tolerance of entomopathogenic fungi to ultraviolet radiation: a review on screening of strains and their formulation. *Current Genetics*. 61(3): 427–440.
- Gabarty, A., Salem, H. M., Fouda, M. A., Abas, A. A., dan Ibrahim, A. A. 2014. Pathogenicity induced by the entomopathogenic fungi *Beauveria bassiana*



and *Metarhizium anisopliae* in *Agrotis ipsilon* (Hufn.). *J. Radiat. Res. Appl. Sci.* 7: 95–100.

Gao, Q., Jin, K., Ying, S. H., Zhang, Y., dan Xiao, G., .2011. Genome Sequencing and Comparative Transcriptomics of the Model Entomopathogenic Fungi *Metarhizium anisopliae* and *M. acridum*. *PLOS Genetics*. 7(1): e1001264.

Gulrajani, M. L. 2008. Degumming of silk. *Review of Progress in Coloration and Related Topics*. 22(1): 79–89.

Gupta, M., Tara, J. S., Sharma, S., dan Bala A. 2015. Biology and morphometry of *Spodoptera litura* Fabricus, a serious defoliator of Mango (*Mangifera indica*) in Jammu Region (J&K). *Munis Entomology & Zoology*. 10: 215.

Howard, R. J., Ferrari, M. A., Roach, D. H., dan Money, N. P. 1991. Penetration of hard substrates by a fungus employing enormous turgor pressures. *Proceedings of the National Academy of Sciences*. 88(24): 11281–11284.

Hu, X., Xiao, G., Zheng, P., Shang, Y., Su, Y., Zhang, X., ... Wang, C. 2014. Trajectory and genomic determinants of fungal-pathogen speciation and host adaptation. *Proceedings of the National Academy of Sciences*. 111(47): 16796–16801.

Humber, R. A. 2012. Identification of entomopathogenic fungi. *Manual of techniques in invertebrate pathology*. 2: 151-187.

Javar, S., Sajap, A. S., Mohamed, R., dan Hong, L. W. 2013. Suitability of *Centella asiatica* (pegaga) as a food source for rearing *Spodoptera litura* (F.) (Lepidoptera: Noctuidae) under laboratory condition. *Journal of plant protection research*. 53(2).

Javier-Hila, A. M. V., dan Caoili, B. L. Cross-infectivity of a putative *Spodoptera picta* nucleopolyhedrovirus to *Spodoptera litura* Fabricius (Lepidoptera: Noctuidae). *Philippine Journal of Science*. 149(3-a): 887-896.

Jaya, K. 2019. Hubungan antara faktor sosial demografi dengan perilaku petani dalam mengaplikasi pestisida. *Jurnal Agrotech*. 9(2): 39-44.

Jena, K., Pandey, J. P., Kumari, R., Sinha, A. K., Gupta, V. P., dan Singh, G. P. 2018. Free radical scavenging potential of *sericin* obtained from various ecoraces of tasar cocoons and its cosmeceuticals implication. *International Journal of Biological Macromolecules*. 1-27.

Joshi, M., Purwar, R., Wazed Ali, S., dan Rajendran, S. 2010. Antimicrobial Textiles for Health and Hygiene Applications Based on Eco-Friendly Natural Products. *Medical and Healthcare Textiles*. 84–92.



- Kakde, A. M., Patel, K. G., dan Tayade, S. 2014. Role of life table in insect pest management-A review. *IOSR Journal of Agriculture and Veterinary Science*. 7(1): 40-43.
- Kavane, R. P. 2014. Studies on Natural Food Plants of Fagara Silkworm *Attacus Atlas* from Western Ghats of Maharashtra. *International Journal of Science and Research*. 3(10): 1165.
- Kludkiewicz, B., Takasu, Y., Fedic, R., Tamura, T., Sehnal, F., dan Zurovec, M. 2009. Structure and expression of the silk adhesive protein *Ser2* in *Bombyx mori*. *Insect Biochemistry and Molecular Biology*. 39(12): 938–946.
- Koen, M. 2018. *Datasheet report for Spodoptera litura (taro caterpillar)*. CABI Crop Protection Compendium. Available online: <https://www.cabi.org/cpc/datasheetreport?dsid=44520>. Diakses terakhir pada tanggal 19 April 2020.
- Koul, O., Jain, M. P., dan Sharma, V. K. 2000. Growth inhibitory and antifeedant activity of extracts from *Melia dubia* to *Spodoptera litura* and *Helicoverpa armigera* larvae. *Indian Journal of Exp. Biology*. 38: 63-68.
- Kumar, J. P., Alam, S., Jain, A. K., Ansari, K. M., dan Mandal, B. B. 2018. Protective activity of silk sericin against UV radiation-induced skin damage by downregulating oxidative stress. *ACS Applied Bio Materials*. 1(6): 2120-2132.
- Lawal, B. 2014. *Applied statistical methods in agriculture, health and life sciences*. Springer. p. 355.
- Lee, K. P. 2010. Sex-specific differences in nutrient regulation in a capital breeding caterpillar, *Spodoptera litura* (Fabricius). *Journal of Insect Physiology*. 56(11): 1685–1695.
- Liu, H. 2015. *Comparing Welch's ANOVA, a Kruskal-Wallis test and Traditional ANOVA in Case of Heterogeneity of Variance*. Tesis. Virginia Commonwealth University, Richmond. Hal: iii.
- Liu, J., Li, S., Li, W., Peng, L., Chen, Z., Xiao, Y., ... dan Mita, K. 2019. Genome-wide annotation and comparative analysis of cuticular protein genes in the noctuid pest *Spodoptera litura*. *Insect biochemistry and molecular biology*. 110: 90-97.
- MacCallum, R. C., Widaman, K. F., Zhang, S., dan Hong, S. 1999. Sample size in factor analysis. *Psychological methods*. 4(1): 84.
- Malarvannan, S., Murali, P. D., Shanthakumar, S. P., Prabavathy, V. R., dan Nair, S. 2010. Laboratory evaluation of the entomopathogenic fungi, *Beauveria bassiana* against the tobacco caterpillar, *Spodoptera litura* Fabricius (Noctuidae: Lepidoptera). *Journal of Biopesticides*. 3(Special Issue): 126.



- Mariyono, J., Kuntariningsih, A., dan Kompas, T. 2018. Pesticide use in Indonesian vegetable farming and its determinants. *Management of Environmental Quality: An International Journal.* 29(2): 305-323.
- Marwoto dan Suharsono. 2008. Strategi dan Komponen Teknologi Pengendalian Ulat Grayak (*Spodoptera litura* Fabricius) pada Tanaman Kedelai. *Jurnal Litbang Penelitian.* 27(4).
- Ment, D., Gindin, G., Rot, A., Soroker, V., Glazer, I., Barel, S., dan Samish, M. 2010. Novel technique for quantifying adhesion of *Metarhizium anisopliae* conidia to the tick cuticle. *Appl. Environ. Microbiol.* 76: 3521–3528.
- Michaille, J. J., Couble, P., Prudhomme, J. C., dan Garel, A. 1986. A single gene produces multiple sericin messenger RNAs in the silk gland of *Bombyx mori*. *Biochimie.* 68(10-11): 1165–1173.
- Michalaki, M. P., Athanassiou, C. G., Kavallieratos, N. G., Batta, Y. A., dan Balotis, G. N. 2006. Effectiveness of *Metarhizium anisopliae* (Metschinkoff) Sorokin applied alone or in combination with diatomaceous earth against *Tribolium confusum* Du Val larvae: Influence of temperature, relative humidity and type of commodity. *Crop Protection.* 25(5): 418-425.
- Mochida, O. 1973. Two important insect pests, *Spodoptera litura* (F.) and *S. littoralis* (Boisd.) (Lepidoptera: Noctuidae), on various crops-morphological discrimination of the adult, pupal, and larval stages. *Applied entomology and zoology.* 8(4): 205-214.
- Moslim, R., dan Kamarudin, N. 2014. The use of palm kernel cake in the production of conidia and blastospores of *Metarhizium anisopliae* var. major for control of the *Oryctes rhinoceros*. *Journal of Oil Palm Research.* 26: 133.
- Nascimento, É., da Silva, S. H., Marques, E. R., Roberts, D. W., Braga, G. U. L. 2010. Quantification of cyclobutane pyrimidine dimers induced by UVB radiation in conidia of the fungi *Aspergillus fumigatus*, *Aspergillus nidulans*, *Metarhizium acridum* and *Metarhizium robertsii*. *Photochem Photobiol.* 86:1259–1266.
- Nath, C., Bordoloi, P. K., Chutia, B. B., Gogoi, L., dan Goswani, B. 2016. A new record of six larval instars in *Attacus atlas* L. (Saturniidae) from North Eastern India. *Journal of Entomology and Zoology Studies.* 4(3): 399.
- Nathan, S. S., Kalaivani, K., dan Chung, P. G. 2005. The effects of azadirachtin and nucleopolyhedrovirus on midgut enzymatic profile of *Spodoptera litura* Fab. (Lepidoptera: Noctuidae). *Pesticide Biochemistry and Physiology.* 83(1): 46-57.



- Nation, J. L. 2008. *Insect Physiology and Biochemistry Second Edition*. CRC Press: London. Hal: 30-31.
- Norris, A. E., dan Aroian, K. J. 2004. To transform or not transform skewed data for psychometric analysis: that is the question!. *Nursing Research*. 53(1): 67-71.
- Nozad-Bonab, Z., Hejazi, M. J., Iranipour, S., Arzanlou, M., dan Biondi, A. 2021. Lethal and sublethal effects of synthetic and bio-insecticides on *Trichogramma brassicae* parasitizing *Tuta absoluta*. *Plos one*. 16(7): e0243334.
- Ortiz-Urquiza, A., Vergara-Ortiz, A., Santiago-Álvarez, C., dan Quesada-Moraga, E. 2010. Insecticidal and sublethal reproductive effects of *Metarhizium anisopliae* culture supernatant protein extract on the Mediterranean fruit fly. *Journal of Applied Entomology*. 134(7): 581-591.
- Quesada-Moraga, E., Santos-Quirós, R., Valverde-García, P., dan Santiago-Alvarez, C. 2004. Virulence, horizontal transmission, and sublethal reproductive effects of *Metarhizium anisopliae* (Anamorphic fungi) on the German cockroach (Blattodea: Blattellidae). *Journal of Invertebrate Pathology*. 87(1): 51-58.
- Pandey, R. E. N. U., dan Hasan, W. A. J. I. D. 2009. Pathogenicity of entomopathogenic fungi, *Metarhizium anisopliae* against tobacco caterpillar, *Spodoptera litura* (Fabricius). *Trends Biosci*. 2: 29-30.
- Pérez-Rigueiro, J., Elices, M., Llorca, J., dan Viney, C. 2001. Tensile properties of *Attacus atlas* silk submerged in liquid media. *Journal of Applied Polymer Science*. 82(1): 53–62.
- Perveen, F. 2006. Reduction in egg hatch after a sublethal dose of chlorfluazuron to larvae of the common cutworm, *Spodoptera litura*. *Physiological Entomology*. 31(1): 39-45.
- Pozzobon, V., Levasseur, W., Do, K. V., Palpant, B., dan Perré, P. 2020. Household aluminum foil matte and bright side reflectivity measurements: Application to a photobioreactor light concentrator design. *Biotechnology Reports*. 25: e00399.
- Prakash, G. B., Sankar, U. R., dan Padmaja, V. 2015. Development and testing of mycotoxicide formulations of *Metarhizium anisopliae* (Metschnikoff) for shelf life and field application against *Spodoptera litura* (Feb) larvae. *International Journal of Bioassays*. 4: 4284-4289.
- Prayogo, Y., dan Tengkano, W. 2002. Effect of age of *Spodoptera litura* larvae on the effectivity of *Metarhizium anisopliae*. *Biosfera (Indonesia)*. 19(3): 70-76.



- Ramos, Y., Taibo, A. D., Jiménez, J. A., dan Portal, O. 2020. Endophytic establishment of *Beauveria bassiana* and *Metarhizium anisopliae* in maize plants and its effect against *Spodoptera frugiperda* (JE Smith)(Lepidoptera: Noctuidae) larvae. *Egyptian Journal of Biological Pest Control.* 30(1): 1-6.
- Ramzan, M., Sajid, Z., Sattar, Z., Abbas, D., Yaseen, T., Mehmood, S., dan Yaseen, I. 2020. Biological and morphological parameters of armyworm, *Spodoptera litura* in cabbage and maize plants under laboratory conditions in Southern Punjab, Pakistan. *Journal of Environmental Issues and Agriculture in Developing Countries.* 12: 2-3.
- Rangel, D. E., Braga, G. U., Flint, S. D., Anderson, A. J., dan Roberts, D. W. 2004. Variations in UV-B tolerance and germination speed of *Metarhizium anisopliae* conidia produced on insects and artificial substrates. *Journal of Invertebrate Pathology.* 87(2-3): 77-83.
- Rao, M. S., dan Prasad, T. V. 2020. Temperature based phenology model for predicting establishment and survival of *Spodoptera litura* (Fab.) on groundnut during climate change scenario in India. *Journal of Agrometeorology.* 22(1): 24-32.
- Razali, N. M., dan Wah, Y. B. 2011. Power comparisons of shapiro-wilk, kolmogorov-smirnov, lilliefors and anderson-darling tests. *Journal of statistical modeling and analytics.* 2(1): 21-33.
- Reddy, N., Zhao, Y., dan Yang, Y. 2013. Structure and properties of cocoons and silk fibers produced by *Attacus atlas*. *Journal of Polymers and the Environment.* 21(1): 16-23.
- Rockwood, D. N., Preda, R. C., Yücel, T., Wang, X., Lovett, M. L., dan Kaplan, D. L. 2011. Materials fabrication from *Bombyx mori* silk fibroin. *Nature Protocols.* 6(10): 1612–1631. doi:10.1038/nprot.2011.379.
- Ruijter, G. J., Bax, M., Patel, H., Flitter, S. J., van de Vondervoort, P. J., de Vries, R. P., ... dan Visser, J. 2003. Mannitol is required for stress tolerance in *Aspergillus niger* conidiospores. *Eukaryotic cell.* 2(4): 690-698.
- Ruiz-Nájera, R. E., Molina-Ochoa, J., Carpenter, J. E., Espinosa-Moreno, J. A., Ruiz-Nájera, J. A., Lezama-Gutiérrez, R., dan Foster, J. E. 2007. Survey for hymenopteran and dipteran parasitoids of the fall armyworm (Lepidoptera: Noctuidae) in Chiapas, Mexico. *Journal of Agricultural and Urban Entomology.* 24(1): 35-42.
- Rustiguel, C. B., Fernández-Bravo, M., Guimaraes, L. H. S., dan Quesada-Moraga, E. 2018. Different strategies to kill the host presented by *Metarhizium anisopliae* and *Beauveria bassiana*. *Canadian journal of microbiology.* 64(3): 191-200.



- Ryuda, M., Nakayama, H., dan Hayakawa, Y. 2008. A novel gene associated with intraspecific predation in *Spodoptera litura* larvae. *Applied entomology and zoology*. 43(4): 563-568.
- Sahayaraj, K., dan Borgio, J. F. 2010. Virulence of entomopathogenic fungus *Metarhizium anisopliae* (Metsch.) Sorokin on seven insect pests. *Indian Journal of Agricultural Research*. 44(3): 195-200.
- Santi, L., Beys da Silva, W. O., Berger, M., Guimarães, J. A., Schrank, A., dan Vainstein, M. H. 2010. Conidial surface proteins of *Metarhizium anisopliae*: Source of activities related with toxic effects, host penetration and pathogenesis. *Toxicon*. 55: 874–88.
- Sangwong, G., Sumida, M., dan Sutthikhum, V. 2016. Antioxidant activity of chemically and enzymatically modified sericin extracted from cocoons of *Bombyx mori*. *Biocatalysis and Agricultural Biotechnology*. 5: 155–161.
- Schober, P., Boer, C., dan Schwarte, L. A. 2018. Correlation coefficients: appropriate use and interpretation. *Anesthesia & Analgesia*. 126(5): 1763-1768.
- Searle, T., dan J. Doberski. 1984. An investigation of the entomogenousfungus *Beauveria bassiana* (Bals.) Vuill. as a potential biological control agent for *Oryzaephilus surinamensis* (L.). *J. Stored Prod. Res.* 20: 17–23.
- Selvaraj, S., Adiroubane, D., Ramesh, V., dan Narayanan, A. L. 2010. Impact of ecological factors on incidence and development of tobacco cut worm, *Spodoptera litura* Fabricius on cotton. *Journal of biopesticides*. 3(1): 43.
- Selvaraj, A., Kalaiselvi, T., dan Uthandi, S. 2020. Impact of *Spodoptera litura* Attack on Chlorophyll and Biomass Content of *Vigna mungo* Colonized with Arbuscular Mycorrhizal Fungi and Rhizobium. *Madras Agricultural Journal*. 107(1-3): 1-6.
- Senthil-Nathan, S. 2015. A review of biopesticides and their mode of action against insect pests. In: Thangavel, P., dan Sridevi, G. (eds) *Environmental Sustainability*. Springer: New Delhi. Hal: 49-63.
- Shadduck, J. A., Roberts, D. W., dan Lause, S. 1982. Mammalian safety tests of *Metarhizium anisopliae*: preliminary results. *Environmental entomology*. 11(1): 189-192.
- Shah, F. A., Wang, C. S., dan Butt, T. M. 2005. Nutrition influences growth and virulence of the insect-pathogenic fungus *Metarhizium anisopliae*. *FEMS Microbiology Letters*. 251(2): 259–266.
- Shehu, K., dan Bello, M. T. 2011. Effect of environmental factors on the growth of *Aspergillus* species associated with stored millet grains in Sokoto. *Nigerian Journal of Basic and Applied Sciences*. 19(2): 218-223.



- Shorey, H. H. 1963. A Simple Artificial Rearing Medium for the Cabbage Looper. *Journal of Economic Entomology*. 56(4): 536–537.
- Shorey, H. H., dan Hale, R. L. 1965. Mass-rearing of the larvae of nine noctuid species on a simple artificial medium. *Journal of economic Entomology*. 58(3): 522-524.
- Shryock, H. S., dan Siegel, J. S. 1980. *The methods and materials of demography* (Vol. 2). Academi Press: San Diego. Hal: 313.
- Straten, M. J., Germain, J. F. dan Bart, T. L. H. 2015. PM 7/124 (1) Spodoptera littoralis, Spodoptera litura, Spodoptera frugiperda, Spodoptera eridania. *EPPO Bulletin*. 45(3): 415.
- Sukontason, K. L., Boonsriwong, W., Siriwantranungsee, S., Piangjai, S., dan Sukontason, K. 2006. Morphology of puparia of *Megaselia scalaris* (Diptera: Phoridae), a fly species of medical and forensic importance. *Parasitology Research*. 98(3): 268-272.
- Tabunoki, H., Higurashi, S., Ninagi, O., Fujii, H., Banno, Y., Nozaki, M., dan Sato, R. 2004. A carotenoid-binding protein (CBP) plays a crucial role in cocoon pigmentation of silkworm (*Bombyx mori*) larvae. *FEBS Letters*. 567(2-3): 175–178.
- Takasu, Y., Hata, T., Uchino, K., dan Zhang, Q. 2010. Identification of *Ser2* proteins as major sericin components in the non-cocoon silk of *Bombyx mori*. *Insect Biochemistry and Molecular Biology*. 40(4): 339–344.
- Tampubolon, D. Y., Pangestiningsih, Y., Zahara, F., dan Manik, F. 2013. Uji Patogenisitas *Bacillus thuringiensis* dan *Metarhizium anisopliae* Terhadap Mortalitas *Spodoptera litura* Fabr (Lepidoptera: Noctuidae) Di Laboratorium. *Agroekoteknologi*. 1(3).
- Tamura, Y., Nakajima, K., Nagayasu, K., dan Takabayashi, C. 2002. Flavonoid 5-glucosides from the cocoon shell of the silkworm, *Bombyx mori*. *Phytochemistry*. 59(3): 275–278.
- Taufika, R., Sumarmi, S., dan Nugroho, S. A. 2020. Efek subletal campuran ekstrak daun srikaya (*Annona squamosa* L.) dan rimpang kunyit (*Curcuma domestica* Val.) terhadap larva *Spodoptera litura* F. *AGROMIX*. 11(1): 66-78.
- Teja, K. N. P. C., dan Rahman, S. J. 2016. Characterisation and evaluation of *Metarhizium anisopliae* (Metsch.) Sorokin strains for their temperature tolerance. *Mycology*. 7(4): 171–179.
- Tipton, E., Hedges, L., Vaden-Kiernan, M., Borman, G., Sullivan, K., dan Caverly, S. 2014. Sample selection in randomized experiments: A new



- method using propensity score stratified sampling. *Journal of Research on Educational Effectiveness.* 7(1): 114-135.
- Tripoulas, N. A., dan Samols, D. 1986. Developmental and hormonal regulation of sericin RNA in the silkworm, *Bombyx mori*. *Developmental Biolog.* 116(2): 328–336.
- Tsunokaye, A. R. 1932. Degumming Action of Soap on Raw Silk. *Journal of the Society of Dyers and Colourists.* 48(6): 164–167.
- Tuan, S. J., Lee, C. C., dan Chi, H. 2013. Population and damage projection of *Spodoptera litura*(F.) on peanuts (*Arachis hypogaea*L.) under different conditions using the age-stage, two-sex life table. *Pest Management Science.* 70(5): 805–813.
- Turro, N. J., dan Yekta, A. 1978. Luminescent probes for detergent solutions. A simple procedure for determination of the mean aggregation number of micelles. *Journal of the American Chemical Society.* 100(18): 5951-5952.
- Vashisth, S., dan Chandel, Y. S. 2013. Morphometrics of *Spodoptera litura* on tomato. *Indian Journal of Plant Protection.* 2: 175-177.
- Vassilakos, T. N., C. G. Athanassiou, N. G. Kavallieratos, dan B. J. Vayias. 2006. Infuence of temperature on the insecticidal effect of *Beauveria bassiana* in combination with diatomaceous earth against *Rhyzopertha dominica*and *Sitophilus oryzae* on stored wheat. *Biol. Control.* 38: 270–281.
- Vilcinskas, A., Matha, V., dan Götz, P. 1997. Inhibition of phagocytic activity of plasmacytocytes isolated from *Galleria mellonella* by entomogenous fungi and their secondary metabolites. *Journal of Insect Physiology.* 43(5): 475–483.
- Wang, B., Kang, Q., Lu, Y., Bai, L., dan Wang, C. 2012. Unveiling the biosynthetic puzzle of destruxins in *Metarhizium* species. *Proceedings of the National Academy of Sciences.* 109(4): 1287-1292.
- Wang, X., Li, Y., Liu, Q., Tan, X., Xie, X., Xia, Q., dan Zhao, P. 2019. GC/MS-based metabolomics analysis reveals active fatty acids biosynthesis in the Filippi's gland of the silkworm, *Bombyx mori*, during silk spinning. *Insect Biochemistry and Molecular Biology.* 105: 1–9.
- Wang, Y. J., dan Zhag, Y. Q. 2011. Three-layered sericins around the silk fibroin fiber from *Bombyx mori* cocoon and their amino acid composition. *Advanced Materials Research.* 175-176: 158–163.
- Wiratno, I. M., Taniwiryo, D., Van den Brink, P. J., Rietjens, I. M., dan Murk, A. J. 2007. A case study on Bangka Island, Indonesia on the habits and consequences of pesticide use in pepper plantations. *Environmental Toxicology.* 22(4): 405.



- Wu, J. H., Wang, Z., dan Xu, S. Y. 2007. Preparation and characterization of sericin powder extracted from silk industry wastewater. *Food Chemistry*. 103(4): 1255–1262.
- Yang, M., Shuai, Y., He, W., Min, S., dan Zhu, L. 2012. Preparation of Porous Scaffolds from Silk Fibroin Extracted from the Silk Gland of *Bombyx mori* (*B. mori*). *International Journal of Molecular Sciences*. 13(6): 7762–7775.
- Zheng, X. L., Cong, X. P., Wang, X. P., dan Lei, C. L. 2011. Pupation behaviour, depth, and site of *Spodoptera exigua*. *Bulletin of Insectology*. 64(2): 209–214.
- Zimmermann, G. 1982. Effect of high-temperatures and artificial sunlight on the viability of conidia of *Metarhizium anisopliae*. *J Invertebr Pathol*. 40(1):36–40.
- Zimmermann, G. 1992. Laboratory experiments on the vertical movement of the entomopathogenic fungus *Metarhizium anisopliae* (Metsch.) Sorok. in standard soils and sand. *Nachrichtenblatt des Deutschen Pflanzenschutzdienstes (Braunschweig)*. 44(1): 19-23.
- Zimmermann, G., Papierok, B., dan Glare, T. 1995. Elias Metschnikoff, Elie Metchnikoff or Ilya Ilich Mechnikov (1845-1916): A Pioneer in Insect Pathology, the First Describer of the Entomopathogenic Fungus *Metarhizium anisopliae* and How to Translate a Russian Name. *Biocontrol Science and Technology*. 5(4): 527–530.