

Review Study on Post Harvest Threats: Insect Pest (*Sitophilus oryzae*)

Dr. Shashi Bala

Associate Professor, Department of Zoology, Raghunath Girls Post Graduate College, Uttar Pradesh, INDIA

Corresponding Author: shashiverma1580@gmail.com



www.jrasb.com || Vol. 5 No. 1 (2026): February Issue

Received: 17-02-2026

Revised: 22-02-2026

Accepted: 27-02-2026

ABSTRACT

Post harvesting losses is serious problem due to some factors including nutritional deficiency, sanitary, physical and improper management., it is started from maturation up to utilization. *Sitophilus oryzae* stored grains insect pest is occur everywhere world-wide in distribution .it is dangerous insect pest for stored food grains such as wheat, maize rice, corn, barley, sorghum etc and all the products prepared from these stored grains throughout also affect its qualitatively as well as quantity il cause severe economic loss, in India by insect pests after post harvesting estimated reaches up to 12-16 million metric tons loss annually. it reaches approximately 6.5% of Total grain storage due to, insect pest approximately 25-30%, crop yields destroyed by different insect pests during storage and field (In these in region where storage facilities are in adequate, they relied completely on susceptibility or resistance on Stored food grains of by combining of other strategies for protection of grains by insect pest effectively through pest Control *Sitophilus oryzae* is biggest threat to stored grains throughout wide world.

Keywords- Rice weevil, Post harvesting, loss, Food Grains.

I. INTRODUCTION

Today Losses of food grains after post harvesting is major problem due to Different fibbers like physical, sanitary starting from maturation up to its utilization by consumer. (Choudhary et.al. 2014) It is an Important part of post harvesting system act as vital role in journey from field to consumers peoples (Padin et. al. 2002). almost 9%. Postharvest Losses in developed Country while in developing countries .it reaches up to 50% economic losses (Cao etal2024) 12-16 million metric tons annually losses has been reported in India after in post harvesting by pests. It reaches approximately 6.5% of Total grain storage (Okram, 2019 & Padin Singh) due to, insect pest approximately 25-30%, crop yields destroyed by Different insect pests during storage and field (Lal, S 1985 & Okram, 2019). *Sitophilus oryzae* is highly destructive insect pest worldwide distributed it cause approximately 10-65%, damage under appropriate storage condition during storage and 80 percentage Damage during prolonged Under Storage conditions (Long Staff, et.al., 1981) (Mehta V. Kumar, 2021), it also damage other grains

such as wheat, Rice, maize buckwheat, dried beans. Pulses, cashew nut etc it Causes both qualitatively losses and quantitative it stored products et alter aesthetic and nutritional value and rejecting grain mass and usability by industries. *Sitophilus oryzae* Rice Weevil Cause 10-65 percentage grain damage under the ordinary storage Condition while 80%. grain damage recorded at in prolonged Conditions (Mehta 2021 & P.K, 2010). A very big losses and deuteriation of food grain after Post harvesting declines quality of grain and it is developing & developed Countries and for improving key factor to attain food security in both the quality of quantity of Stored grain is too Necessary to effective Control of Insect pests (Rice weevils). Different control methods were employed and these Control Strategies includes modern era traditional methods. Major losses and deterioration of cereals after Post harvest management declines quality of storage grains. it is developing & developed Countries for Improving factor to attain food security in both the quality of quantity of Stored grains is to Necessary effective Control of Insect pests. Different control methods were employed and these Control Strategies includes modern era traditional Control

methods. although use of different Chemical is one of holders' hostplant Most Common using methods. but it more expensive to small Resistance it more suitable and Sustainable and major Component of Integrated pest management which is cost effective and safe environment (Rouret, 2002, Abebe 2009, Tefera et. al. 2011) (Juhi & Shyam 2024).

Strategies using for controlling grain damage under storage by *Sitophilus oryzae*.

Strategies For Controlling grain damage Under storage by-

- By chemical Control of *Sitophilus oryzae*
- In Modern era different advanced Technologies has been used by farmers for pest Control and a storage of Grains. most of chemical has is used in agriculture known as miracle weapon in frontline in management of insect Pest Under storage Conditions Control of insect population relied on heavily application of liquid or gaseous chemicals over reliance on particular chemical which resulted Complication cause residual hazardous environmental pollution, Negative effects on human being Non Target organism, failure of Controlling and disrupts the biological System due to natural enemies which emergence of insect pest. (Choudhary et. al., 2014 Kim, 2003 & Mehta). Utilization of chemicals For Pest Control is Limited due to safety and Regulations which proximity to food (Padin et. al. 2002). Regulatory issues regarding different chemical Such as Fumigants. Chloropicrin, dichloride's, methyl bromide and Phosphine, methyl bromide all are most effective methods ay stored grains, food stuffs agricultural commodities from insect infestation. *Sitophilus oryzae* is of growing rapidly due to easily adapt like phosphine (95). This is Urgent to Need Control of Insect pests (under storage alternative of Chemical Insecticides with fumigant actions. (Champ 1977 & Kim, 2003)

II. BIOLOGICAL CONTROL

Reduction of Rice weevil populations exhibited by some Predators and parasitoids and *Anisopteromalus calandrae* (Steidle & Schallar 2002) besides this entomopathogenic fungi exhibit biocontrol of rice weevil *Beauveria basilina*, metarhizium anisopliae (Rashid et. al. 2011). Rice weevil *Sitophilus* population also control by Neem *Azadirachta indica* and diatomaceous earth both having insecticidal Properties (Tripathi' et. al. 2009). It is long term pest Control method and environmentally safe No chemical Some parasitic Wasp (*Anisopteromalus Calandrae*) lays their egg inside the larva of Rice weevil which kill them before maturation Some bacteria (*Bacillus thuringiensis* (Bt) used in Control of larvae as a pesticide. A fungus (*Beauveria bassiana*) kills adult Rice weevil due to their infection S. Gurjar (2025) By using Combination ay Short and long

reads to Sequence of s. *Oryzae* genome Resulting most comprehensive assembly for curculionidae species to date after analysis of data show that s oryzae has Experienced successive bursts of Transposable element (TE) amplification. Constituting 72%, of genome (Parisot et. al. 2021) Asawalam et al (2012) Reported about using ay Powder of indigenous botanical Plant in Nigeria including Curcuma longa1. Rhizome, Piper, guineense, schim and Thonn use of these botanicals Powder increase adult mortality Rate and Supress the adult emergence of Rice weevil.

III. PHYSICAL CONTROL

During storage of grains temperature maintain at more than 10°C and heat Exposure at> 50% which destroyed Rice weevil and in shortage of oxygen level during storage slow Rate of Infestation (Finn etal2004). Use of some botanicals such as Neem *Azadirachta indica* and diatomaceous earth show properties of Insecticides (Tripathi etal2009). Combining chemical and other preventive measures provides long term sustainable control (Loririetal2007) biologically by Implementing best practices such as drying of grains, Periodically Monitoring of grains is Necessary for effective Control of weevils (Phillip Thorne 2010). *By using Nano technology such as silica and silver nanoparticles having haven Insecticidal properties, (S. Gurjar, 2025).

IV. HOSTPLANT RESISTANCE

Another strategies for by rice controlling of yield loss during storage by rice weevil are by using of Resistant varieties, those areas where storage facilities are inadequate only resistant Varieties or as an adjunct chemical Control to protect yield loss (Promod et. al. 2002) reported presence of resistance varieties A/B line, R lines Commercial, mutant, Germ Plasm, and locals. Results highly showed Resistant varieties among parental lines and hybrid to ensure best way to Protection of yield loss during storage by Rice weevil. (Prasad et. al. 2015) Reported Resistance to s. oryzae.

Natural Oils:

Many plant species have repellents and insecticidal activity and their Natural Oils (Koul 2008, "J Mollaei et. al. 2003), Natural product of the plant so shows detrimental effects on their environment and no target their pesticidal effect on their. Natural oil shows their effect an oviposition and growth inhibitory activity (Tripathi et. al. 2001)

Volatile Substance:

Against s. *oryzae* & *Rhizopertha domnica* some volatile Constituents such as methyl Salicylate from securidacalonga pedunculata exhibit toxic and repellent activities reported by (Jayasekara et. al. (2005) seeds of Cinnamoum Camphor a (1) Shown repellent activity (Insecticidal) against *S. oryzae* and *Bruchus rugimanus*

(Liu et. al. 2006). Plant products exhibit toxicity against pests of stored grains provide more prolonged protection to seeds those may be due to high rate of mortality I of ad adult insects besides the Impact on oviposition and low hatching (Huang Subramanyam 2004).

Effect and damage Caused by insect pest *Sitophilus*

(1) Economic loss.

Stored food grain loss annually 5 to 20%, annually (Rajendra 2019). Due to infestation deteriorate the quality of stored grain and weight loss (Padin et. al.) 2002),

(2) Nutritional, & physical damage.

Damaged grains show brittle, weight loss and residues of infested grains (Zettler & Arthur 2000). Analyses of Nutritional Content in damaged 01 grains reduction in Carbohydrate and proteins Contents (Hang et. al. 2020).

V. HEALTH IMPACT

Infestation of insect pests increase risk of mycotoxin contamination and it promote growth of fungal. Aflatoxins and ochratoxin from infested grain pose serious food safety.

VI. RECENT ADVANCEMENTS

Genetically modified develops Resistant Varieties which reduce post harvested loss of grains. Different molecular tools also helpful in in rapid Rate of infestation detection, by adopting of chemical pesticides. friendly techniques which is alternative of chemical pesticides.

VII. CONCLUSION

Sitophilus oryzae is dangerous Insect pest in stored grains. it Causes major economic loss, Deterioration of grains, and Negative impact on human health. Chemical pesticides are also available but its use is limited due to (strictly safe Regulation Besides chemical pesticides by eco-friendly, biodegradable, with pests Safety of human being. Advance technologies in Genetics Research nanotechnology, climate change Research Shape future of Rice Weevil. Management.

REFERENCES

- [1] Asawalam, E. F., Ebere, U. E., & Emeasor, K. C. (2012). Effect of some plant products on the control of rice weevil *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae). *Journal of Medicinal Plants Research*, 6(33), 4811–4814.
- [2] Abebe, F., Tefera, T., Mugo, S., Beyene, Y., & Vidal, S. (2009). Resistance of maize varieties to the maize weevil *Sitophilus zeamais* (Motsch.) (Coleoptera: Curculionidae). *African Journal of Biotechnology*, 8, 5937–5947.
- [3] Cao, Y., Hu, Q., Huang, L., Athanassiou, C. G., Maggi, F., D'Isita, I., Liu, Y., Pistillo, O. M., Miao, M., Germinara, G. S., & Li, C. (2024). Attraction of *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae) to the semiochemical volatiles of stored rice materials. *Journal of Pest Science*, 97, 73–85.
- [4] Champ, B. R., & Dyte, C. E. (1977). FAO global survey of pesticide susceptibility of stored grain pests. *FAO Plant Protection Bulletin*, 25(2), 49–67.
- [5] Choudhury, S. D., & Chakraborty, K. (2014). Study on the life cycle and morphometrics of *Sitophilus oryzae* on rice cultivar Sampamashuri under laboratory conditions. *Journal of Applied Science and Research*, 2(6), 22–28.
- [6] Huang, F., & Subramanyam, B. (2004). Responses of *Corcyra cephalonica* (Stainton) to pirimiphos-methyl, spinosad and combinations of pirimiphos-methyl and synergized pyrethrins. *Pest Management Science*, 60(2), 191–198.
- [7] Gupta, J., & Shyam. (2024). Review study on *Sitophilus oryzae* (L.): A pest of stored food grains. *Innovation: The Research Concept*, 9(2), 1–9.
- [8] Gurjar, S. (2025). Rice weevil (*Sitophilus oryzae*): Impact, control strategies and ecological adaptation. *International Journal of Creative Research Thoughts*, 13(3), 650–667.
- [9] Jayasekara, T. K., Stevenson, P. C., Hall, D. R., & Belmain, S. R. (2005). Effect of volatile constituents from *Securidaca longipedunculata* on insect pests of stored grain. *Journal of Chemical Ecology*, 31(2), 303–313.
- [10] Koul, O., Walia, S., & Dhaliwal, G. S. (2008). Essential oils as green pesticides: Potential and constraints. *Biopesticides International*, 4(1), 63–84.
- [11] Liu, C. H., Mishra, A. K., Tan, R. X., Yang, H., & Shen, Y. F. (2006). Repellent and insecticidal activities of essential oils from *Artemisia princeps* and *Cinnamomum camphora* and their effect on seed germination of wheat and broad bean. *Bioresource Technology*, 97(15), 1969–1973.
- [12] Longstaff, B. C. (1981). Biology of grain pest species of the genus *Sitophilus* (Coleoptera: Curculionidae): A critical review. *Protection Ecology*, 2, 83–130.
- [13] Lal, S., & Srivastava, B. P. (1985). Insect pests of stored wheat in Madhya Pradesh (India). *Journal of Entomological Research*, 9(2), 141–148.
- [14] Kim, S. I., Roh, J. Y., Kim, D. H., Lee, H. S., & Ahn, Y. J. (2003). Insecticidal activities of aromatic plant extracts and essential oils against *Sitophilus oryzae* and *Callosobruchus chinensis*.

- Journal of Stored Products Research*, 39, 293–303.
- [15] Mehta, V., & Kumar, S. (2020). Influence of different plant powders as grain protectants on *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae) in stored wheat. *Journal of Food Protection*, 83(12), 2167–2172.
- [16] Mollaei, M., Izadi, H., Hossein, D., Majid, A., & Reza, R. K. (2011). Bioactivity of essential oil from *Satureja hortensis* (Lamiaceae) against three stored product insect species. *African Journal of Biotechnology*, 10(34), 6620–6627.
- [17] Mehta, V., Kumar, S., & C. S. J. (2021). Damage potential, effect on germination and development of *Sitophilus oryzae* (Coleoptera: Curculionidae) on wheat grains in Northwestern Himalayas. *Journal of Insect Science*, 21(3), 1–7.
- [18] Okram, S., & Hath, T. K. (2019). Biology of *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae) on stored rice grains during different seasons in Terai agro-ecology of West Bengal. *International Journal of Current Microbiology and Applied Sciences*, 8(4), 1955–1963.
- [19] Padin, S., Bello, G. D., & Fabrizio, M. (2002). Grain loss caused by *Tribolium castaneum*, *Sitophilus oryzae*, and *Acanthoscelides obtectus* in stored durum wheat and beans treated with *Beauveria bassiana*. *Journal of Stored Products Research*, 38(1), 69–74.
- [20] Pramod, K. K. R., Singh, B. U., & Dharma, R. (2002). Sorghum resistance to the rice weevil *Sitophilus oryzae* (L.): Antixenosis. *Insect Science and Its Application*, 22(1), 9–19.
- [21] Prasad, G. S., Babu, K. S., Sreedhar, M., Padmaja, P. G., Subbarayudu, B., Kalaisekar, A., & Patil, J. V. (2015). Resistance in sorghum to *Sitophilus oryzae* (L.) and its association with grain parameters. *Phytoparasitica*, 43, 391–399.
- [22] Parisot, N., Vargas Chávez, C., Goubert, C., Baa-Puyoulet, P., Baimand, S., Beranger, L., Blanc, C., Bonnamour, A., Boulesteix, M., Burlet, N., Calevro, F., Callaerts, P., Chancy, T., Charles, H., Colella, S., Barbosa, A. D. S., Dell’Aglio, E., Genova, A. D., Febvay, G., ... Heddi, A. (2021). The transposable element-rich genome of the cereal pest *Sitophilus oryzae*. *BMC Biology*, 19(241), 1–28.
- [23] Rounet, G. (1992). *Maize*. London: CTA & Macmillan.
- [24] Singh, P. K. (2010). A decentralized and holistic approach for grain management in India. *Current Science*, 99, 1179–1180.
- [25] Tefera, T., Mugo, S., & Likhayo, P. (2011). Effects of insect population density and storage time on grain damage and weight loss in maize due to the maize weevil *Sitophilus zeamais* and larger grain borer *Prostephanus truncatus*. *African Journal of Agricultural Research*, 6, 2249–2254.
- [26] Tripathi, A. K., Prajapati, V., Aggarwal, K. K., & Kumar, S. (2001). Insecticidal and ovicidal activity of the essential oil of *Anethum sowa* Kurz against *Callosobruchus maculatus* F. (Coleoptera: Bruchidae). *Insect Science and Its Application*, 31(1), 61–66.