WB II Probe Trap: Reduced Length and Efficacy on Trap Catches

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Abstract

The demand on secure non-infested grain products has increasingly grown as the world's population has continued to increase. Historically, the WB II probe trap has demonstrated its reliability as a useful tool in the monitoring of stored product pests.

Recently, our research lab performed replicated comparisons between our standard 13.125-inch STORGARD WB PROBE II grain insect monitoring trap against three reduced trap lengths using three stored product insect species over five sampling periods. Results showed that the reduced tube lengths of 6.5-, 8.5- and 10.5 inches, on average, caught statistically similar numbers of all three species combined compared to the standard length 13.125-inch probe trap.

On average 8.5-inch traps caught more insects overall than all other lengths. Thereby showing that while shorter, the reduced lengths provided optimum efficacy in trap catches, maintaining the WB II's reliability as a useful IPM tool for stored grain insect monitoring.

Introduction

According to the Food Agriculture Organization of the United Nations (FAO) rice, wheat, and corn are the top three food staples of the world, especially in developing countries (FAO, 2021). The United States produced approximately 1.86 billion bushels of wheat in 2020 worth 9.32 billion U. S. dollars (NASS, 2020; Statistica, 2021). IPM tools are a must for monitoring of stored product pests can be performed efficiently and accurately.

Pitfall style traps have previously been shown to be excellent at determining population densities of stored product insects, including *Rhyzopertha dominica, Sitophilus granaries, Oryzaephilus surinamensis,* and *Tribolium castaneum* in a variety of grain storage facilities across Europe (Aulicky et al. 2016).

Historically, the WB II probe trap has proven to be very reliable for the detection of stored product pests, primarily beetles (Toews et al. 2005). The

WB II probe trap was previously shown to monitor for granary weevils (*Sitophilus graniarius*) during the summertime months in the United Kingdom (Wakefield and Cogan 1991). Whereas Trematerra, (1998) noted that WB II probe trap catches of *Sitophilus oryzae*, *T. castaneum* and *O. surinamensis* were similar in wheat and maize. Similarly, Toews et al, (2003), demonstrated that the WB II probe trap caught as many *Cryptolestes ferruginues* when compared with similar types of probe traps. In fact, previously it had been shown that the WB II probe trap is effective in trapping *Rhyzopertha dominica*, *Ahasverus advena*, *Typhaea stercorea* along with *Cryptolestes ferrugineus* (Hagstrum 2001).

Primarily due to increasing oil prices, production costs have also increased. we examined the idea of reducing the size of the WB II to reduce the overall cost of production allowing us to continue to sell a reliable IPM product at a reasonable price.

Materials and Methods

Probe Trap Sizes: Three shortened versions of our WB II probe traps measuring 6.5-, 8.5-, 10.5-inches and compared those with our standard length of 13.125-inches (Fig. 1). This test was performed to see if length had any overall effect, whether negative or positive, on trap catches over-time at 24-, 48-, 72-, 96-, and 120-hours.

Test commodity: USDA certified non-GMO hard red winter wheat purchased from 4-Generations farms near Alva, Oklahoma. Upon receiving the wheat, it was cleaned by using ASTM certified testing sieves; #10, #14, #18, and #20. This was done to ensure that no insects were present in the wheat before the addition of laboratory-reared species.

Bioassay arenas: This test utilized four 7-gallon sealable buckets filled with organic (certified that no pesticide had been applied) hard red winter wheat to within approximately three-inches from the top of each bucket (Fig. 2). This was done to fully insert the longest of the probes to just below the surface of the wheat.

Insects: Three species of laboratory-reared stored product beetles: Rice weevil (RW) (*Sitophilus oryzae*), red flour beetle (RFB) (*Tribolium castaneum*), and Saw-toothed grain beetle (STGB) (*Oryzaephilus surinamensis*) were utilized.

Procedure: One hundred beetles from each species consisting of mixed-sex were added to each of the four buckets 24-hours before insertion of the probe traps to allow the beetles to disperse in the wheat. Pre-cut versions of the WB II probe trap, along with the standard trap were inserted into the wheat to just below the wheat's surface. Trap catches were evaluated at 24-, 48-, 96-, and 120-hours. Dead insects found in the traps were discarded and replaced with live insects to maintain 100 individuals of each species at the time of evaluation.

Statistics: The mean number of insects caught was generated using Microsoft

Excel. The data was recorded for each individual species and all three species combined.

Results and Discussion

Interestingly, our results show that after 120-hours in the wheat, our 8.5-inch version of the WB II caught slightly more of all three species combined when compared with longer versions including the 13.125-inch trap. The much shorter 6.5-inch trap had the least of all total insects caught (Fig. 3).

When evaluated according to species, after 120 hours 6.5-, 8.5- and 13.125-inch probe traps caught an equal number of RW. (fig. 4). Trap captures of STBG in the 8.5-inch WB II were comparable to the other three sizes at each sampling time, however, the 8.5inch caught more STGB at 24-,48-, and 96-hrs than the longer trap versions (Fig. 5). Interestingly, RFB showed an almost linear increase in the number of beetles caught in all trap sizes with the 8.5-inch probe trap catching the most at each sampling (Fig. 6).

Our research showed that reducing the size of the WB II did not have a negative effect on trap catches. the 8.5-inch version of the WB II was comparable to all other trap sizes in trapping all three beetle species.

The reduction in size and the ability to monitor beetle populations maintain the WB II ability to be a reliable monitoring tool. Further research is being developed to test if the depth at which the 8.5-inch probe is inserted in the grain has an impact on the number of beetles caught.

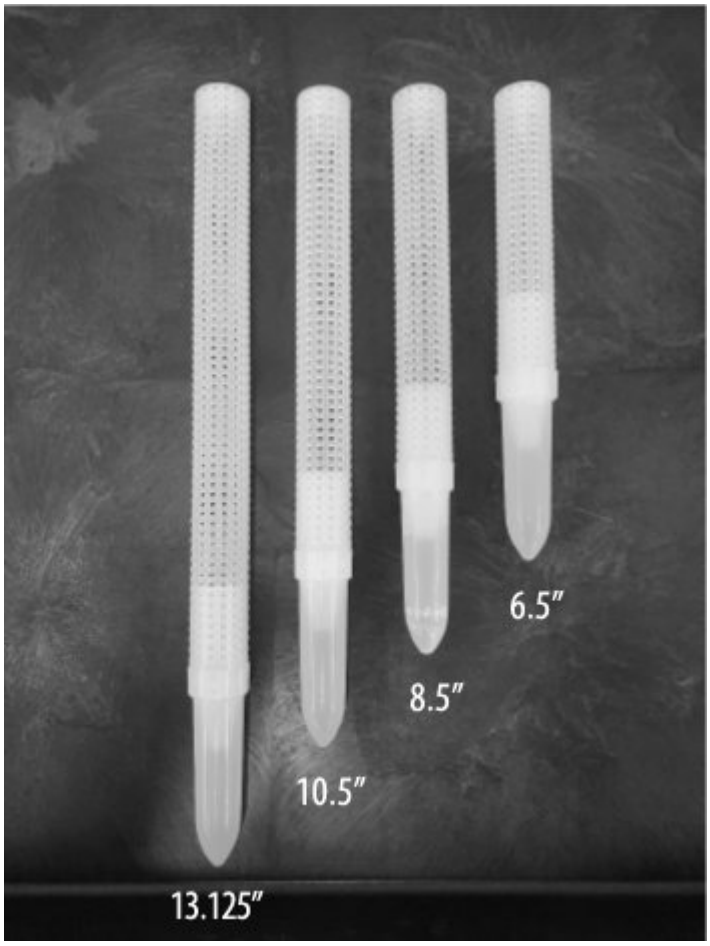


Figure 1. Variants of the WB II probe trap

Figure 2. Probe trap inserted into wheat

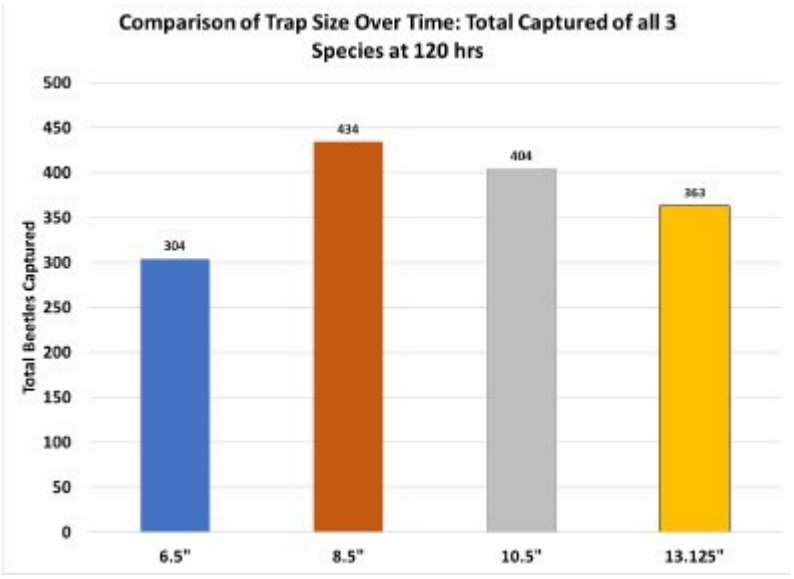
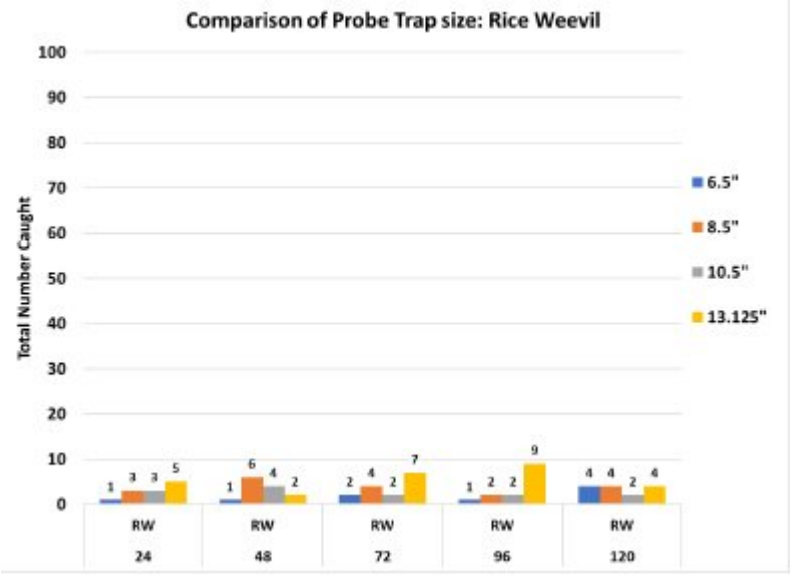
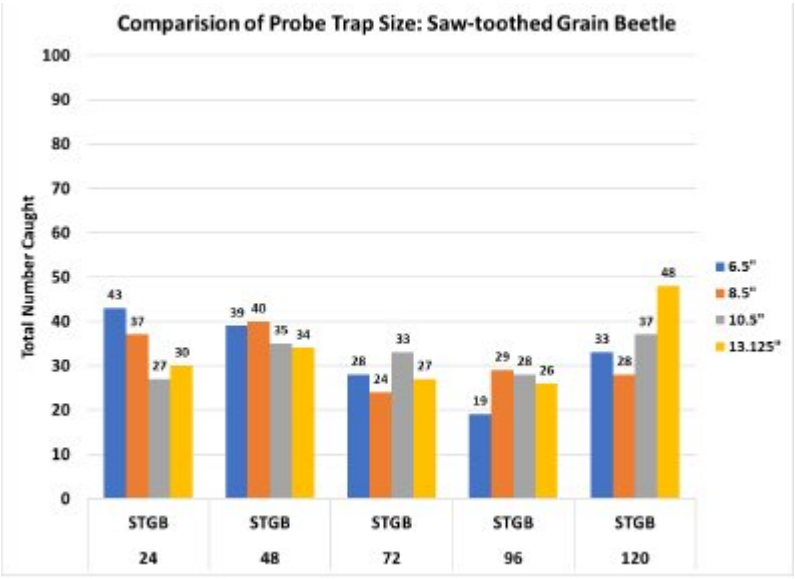


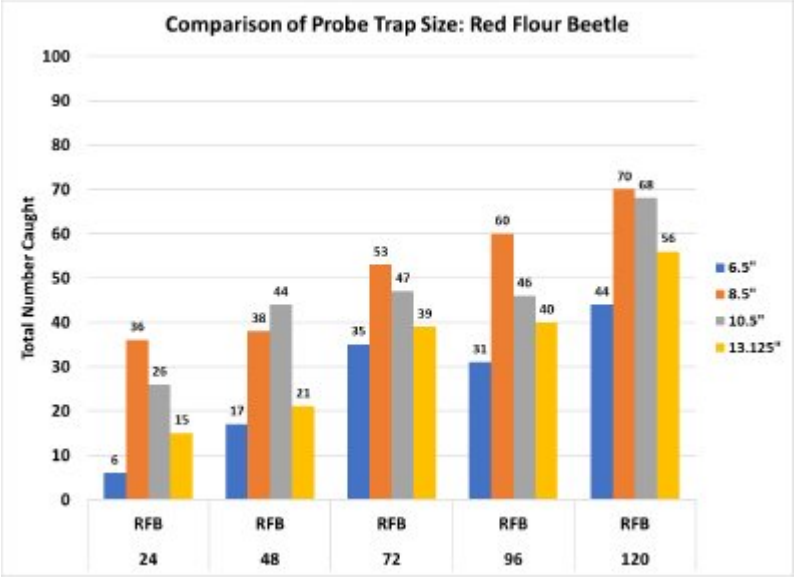
Figure 3. Total trap catches of all four species in each trap size.



Figures 4. Rice Weevils trapped over time.



Figures 5. Saw-toothed grain beetle trapped over time.



Figures 6. Red flour beetle trapped over time.

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