# Red Imported Fire Ant Control With Insecticides and Natural Products in Potted Nursery Soil

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**Nature of Work:** Red imported fire ants, *Solenopsis invicta* Buren, pose serious problems for horticultural nursery managers because of the expense associated with chemical control, the threat to worker safety, and the potential for fire ants to spread to uninfested areas in transported nursery stock. Nurseries based in Georgia need alternative controls for the fire ant that are safe, efficacious, and cost effective. The objective of this study was to test insecticides and natural products for fire ant control in potted nursery soil.

Fire ants used in the nursery studies were obtained from monogyne field populations in Spalding County, GA, and were removed from soil using standard procedures. These colonies were maintained in the laboratory in plastic trays containing artificial nests consisting of 150-mm plastic Petri dishes with dental plaster on the bottom to maintain moisture.

On 12 May 2003, 36 holly, *Ilex glabra* (L.) Gray 'Compacta,' liners were potted in standard soil mix within 11.36-liter containers. Treatments were mixed with the soil at potting and were an untreated control, standard rate of Talstar (nursery granular, bifenthrin, 0.2% AI, FMC, Philadelphia, PA), BotaniGard 22WP (*Beauveria bassiana*, wettable powder, GHA strain, Emerald BioAgriculture Corp., Butte, MT) and a reduced rate of Talstar + BotaniGard. The standard rate of Talstar was 1.18 kg per $m^3$ soil. BotaniGard was mixed with soil at a rate of $2.78 \times 10^{12}$ fungal conidia per $m^3$ soil. This same rate was used for the BotaniGard-only treatment and in combination with the reduced rate of Talstar. The reduced rate of Talstar was 0.44 kg per $m^3$ soil or 37.5% of the standard rate. Containers were placed in an area subject to full sun in the Research and Education Garden at the Georgia Experiment Station, University of Georgia, Griffin Campus. There were three pots per block, and blocks were replicated four times in a randomized complete block design (RCBD).

At the beginning of each test, a small metal spatula was used to place $116 \pm 6$ (mean $\pm$ SE) workers in each pot. Groups of ants were randomly collected from laboratory colonies and samples contained a mixture of minor, media, and major workers. The number of workers placed in pots was determined in previous tests by adding similar volumes of ants to five empty containers, freezing and killing ants, and then counting ants in each container.

Addition of ants to pots was considered to be the start of each experiment. On days following addition of ants, containers were checked for fire ant activity by lightly tapping a pot and visually inspecting the soil surface and inside of the pot for live fire ants. A pot was considered infested if there was one or more live fire ants inside the pot. After tapping the pot, workers would often quickly exit tunnel nests to search for the source of the disturbance. Ants were first added to all pots on 13 May and thereafter were added to uninfested pots on 19 May, 27 May, 2

June, 9 June, 16 June, 23 June, and 7 July. Measurements of plant height were also taken weekly and were begun on 13 May.

The number of infested pots in each replicate was transformed by square root (x + 0.5) before analysis. PROC GLM was used to conduct analysis of variance (ANOVA) in SAS. Means were separated by the least significant differences test (LSD, $P = 0.05$).

**Results and Discussion:** The percentage of untreated and BotaniGard-treated pots that were infested with fire ants was similar throughout the study (Fig. 1–6). Results suggest that *B. bassiana* alone is not sufficient to eliminate infestations. These findings agree with test results from previous years. In the first six weeks of the study, the reduced rate of Talstar + BotaniGard eliminated fire ant activity from pots in a shorter period of time than the standard rate of Talstar (Fig. 1–4). In weeks seven and eight, the reduced rate of Talstar + BotaniGard and the standard rate of Talstar performed equally well by eliminating fire ant infestations from pots within 48–72 h (Fig. 5–6).

On 24 July, mean plant height in untreated, Talstar, BotaniGard, and Talstar + BotaniGard-treated pots was 23.3, 27.3, 27.2, and 26.8 cm, respectively. There were no significant ($F = 1.67$; df = 3; $P = 0.1864$) differences in plant height among treated and untreated pots. Condition of foliage in all pots was healthy and robust and there was no noticeable plant damage in any treated container.

We also tested a proprietary product touted as an alternative to chemical insecticides. While we cannot divulge exact results with this material at this time, we did find that it was not as effective as either Talstar or BotaniGard in eliminating fire ants from containerized nursery stock. Laboratory bioassays further supported these findings.

**Significance to Industry:** Use of a lower rate of Talstar in combination with BotaniGard against fire ants in potted nursery soil may provide monetary savings for nursery managers. Cost analysis was done comparing prices for the rate of Talstar and BotaniGard used with the standard rate of Talstar only. Based on $38.00 for 22.68 kg (50 lb) of Talstar and $48.00 for 0.45 kg (1 lb) of BotaniGard 22WP, the cost to treat 1-$m^3$ soil with the standard rate of Talstar would be $1.98. It would cost $1.44 to treat the same amount of soil with the reduced rate of Talstar and BotaniGard. This cost is 27% less than the standard rate of Talstar only. Labor was not included in calculation of costs, but the additional effort required to prepare the two products for mixture with soil was minimal. For the combination treatment, Talstar and BotaniGard were weighed and added to soil in a cement mixer at the same time. It would be difficult to determine the financial benefits from reduced exposure of nursery workers to insecticide active ingredient. However, improved worker safety would be another positive aspect associated with use of the combination treatments.

Figure 1. Mean (± SEM) percentage of pots infested with fire ants following introduction of ants to treated containers. Treatments were (1) an untreated control, (2) Talstar, (3) *Beauveria bassiana*, (4) or reduced rate of Talstar + *B. bassiana*. For each sampling date, bars with same letter are not significantly different (LSD, $P > 0.05$). *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; NS, not significant.

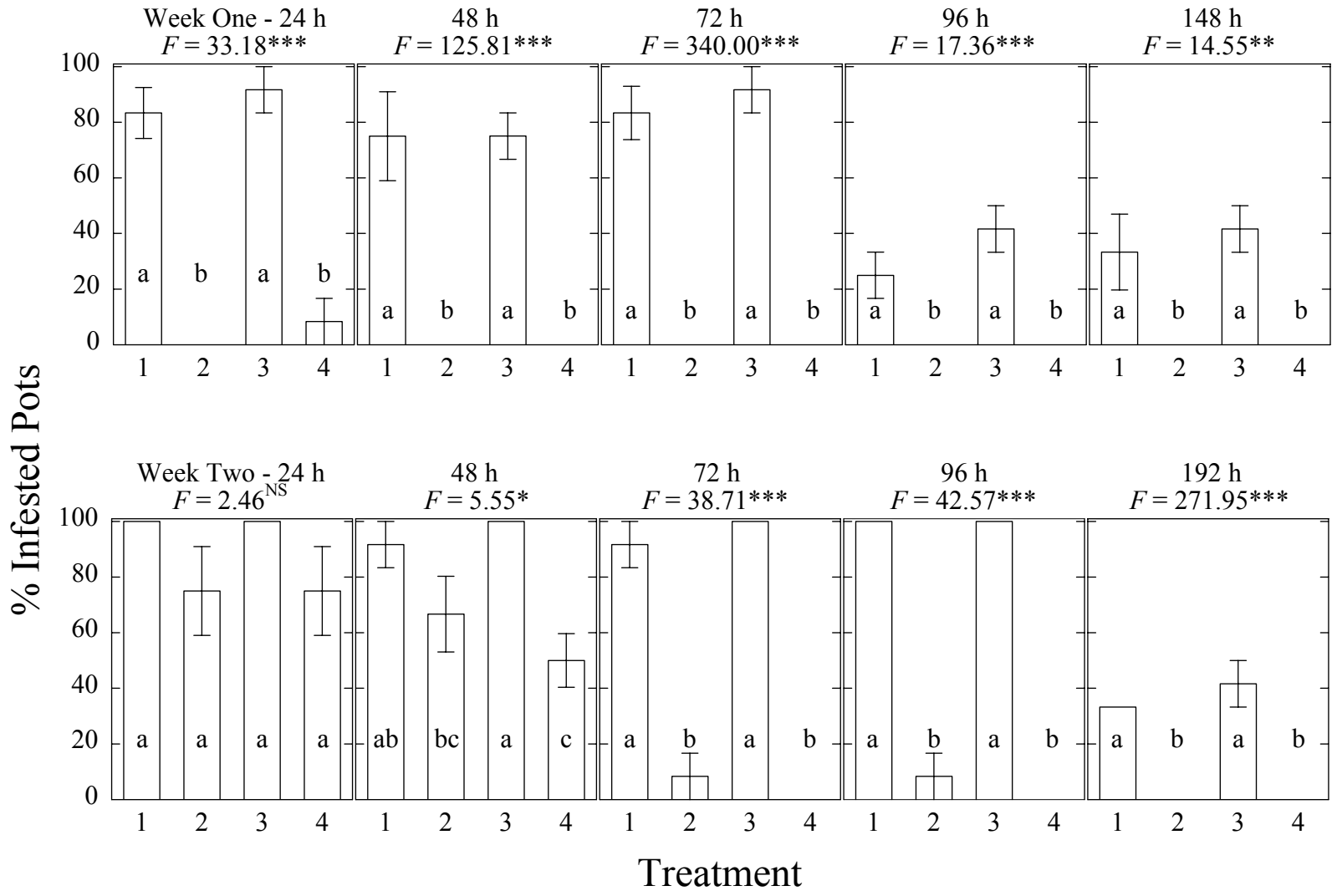

Figure 2. Mean (± SEM) percentage of pots infested with fire ants following introduction of ants to treated containers. Treatments were (1) an untreated control, (2) Talstar, (3) *Beauveria bassiana*, (4) or reduced rate of Talstar + *B. bassiana*. For each sampling date, bars with same letter are not significantly different (LSD, $P > 0.05$). *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; NS, not significant.

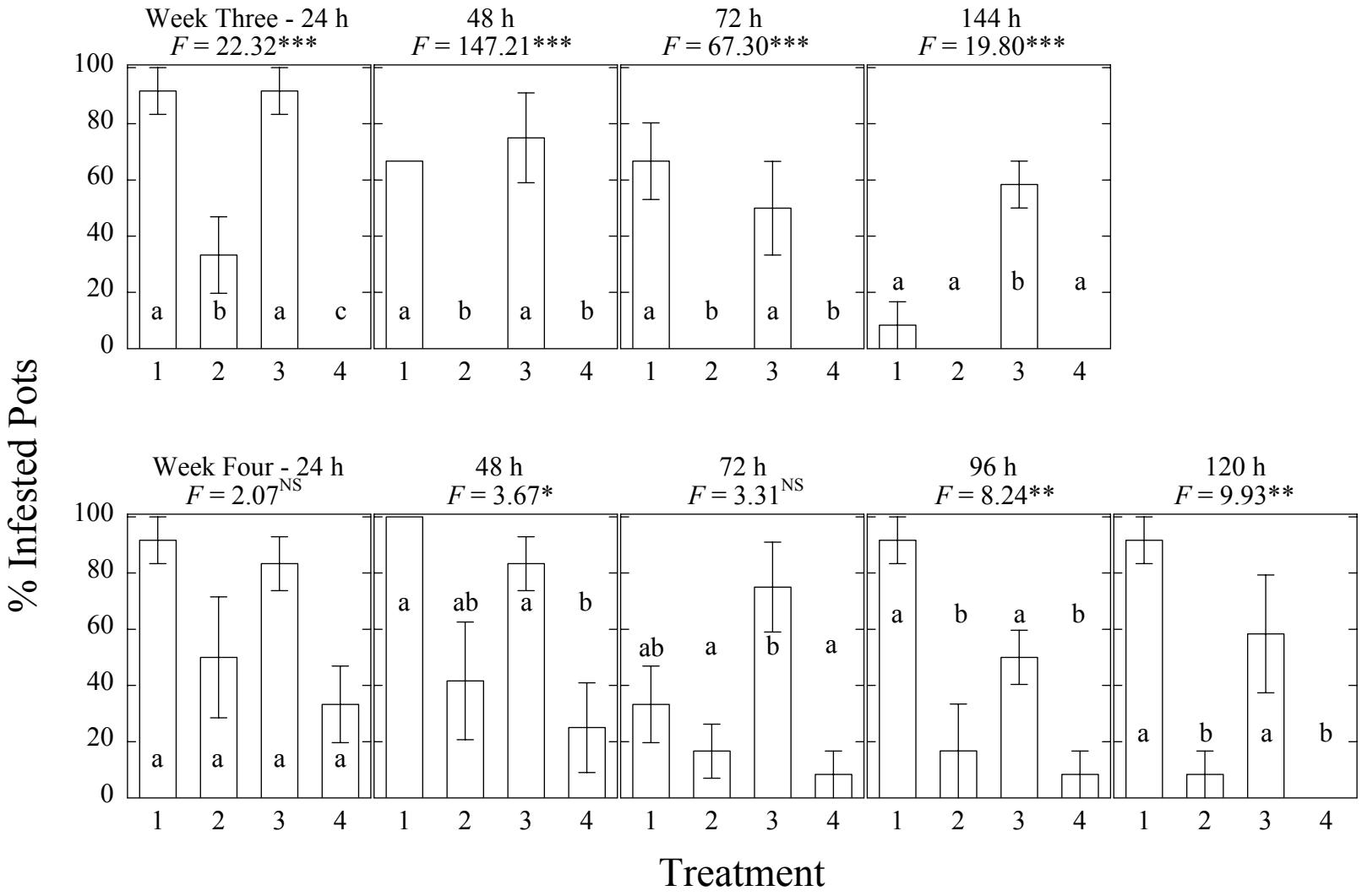

Figure 3. Mean (± SEM) percentage of pots infested with fire ants following introduction of ants to treated containers. Treatments were (1) an untreated control, (2) Talstar, (3) *Beauveria bassiana*, (4) or reduced rate of Talstar + *B. bassiana*. For each sampling date, bars with same letter are not significantly different (LSD, $P > 0.05$). *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; NS, not significant.

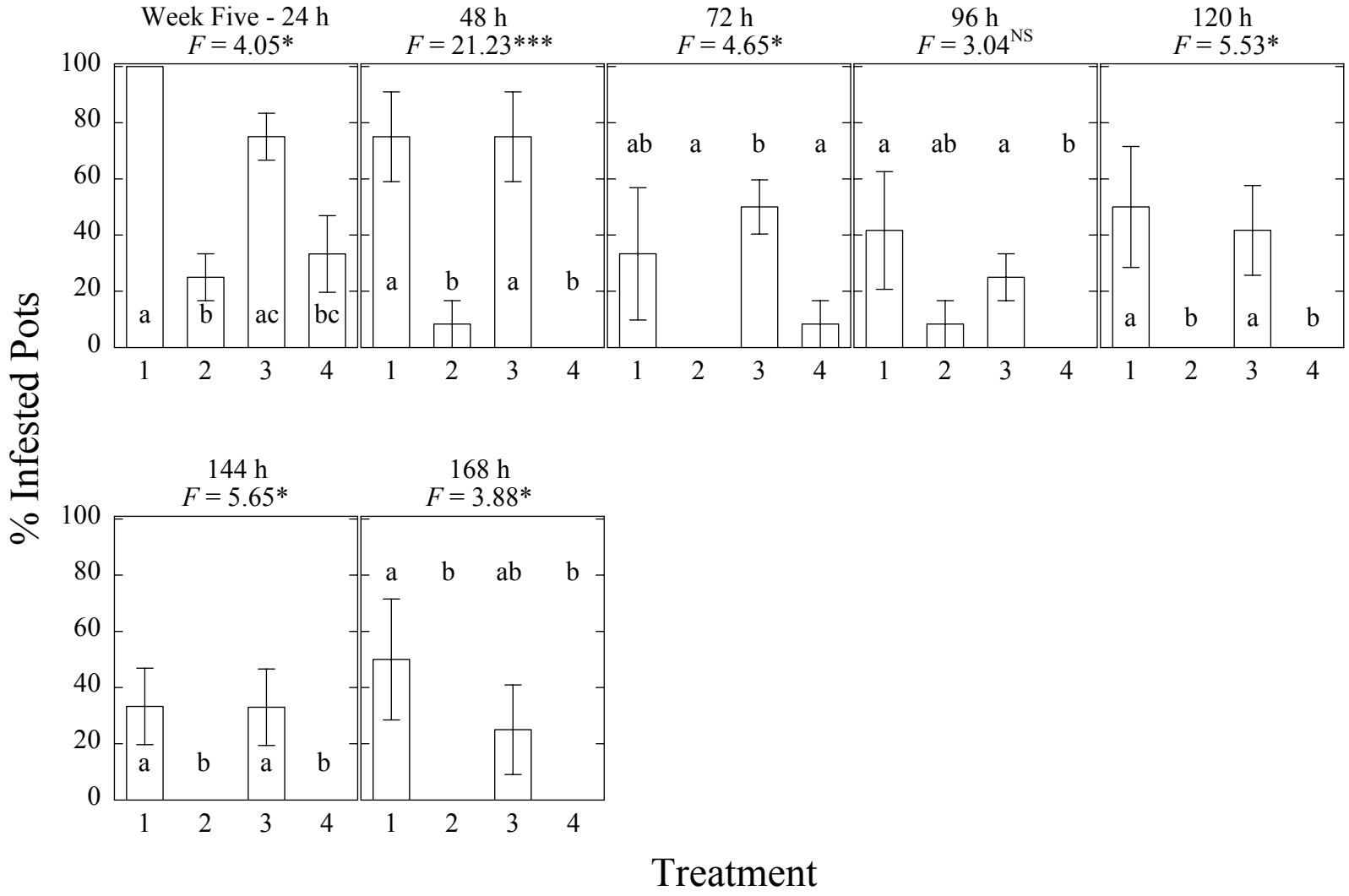

Figure 4. Mean (± SEM) percentage of pots infested with fire ants following introduction of ants to treated containers. Treatments were (1) an untreated control, (2) Talstar, (3) *Beauveria bassiana*, (4) or reduced rate of Talstar + *B. bassiana*. For each sampling date, bars with same letter are not significantly different (LSD, $P > 0.05$). *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; NS, not significant.

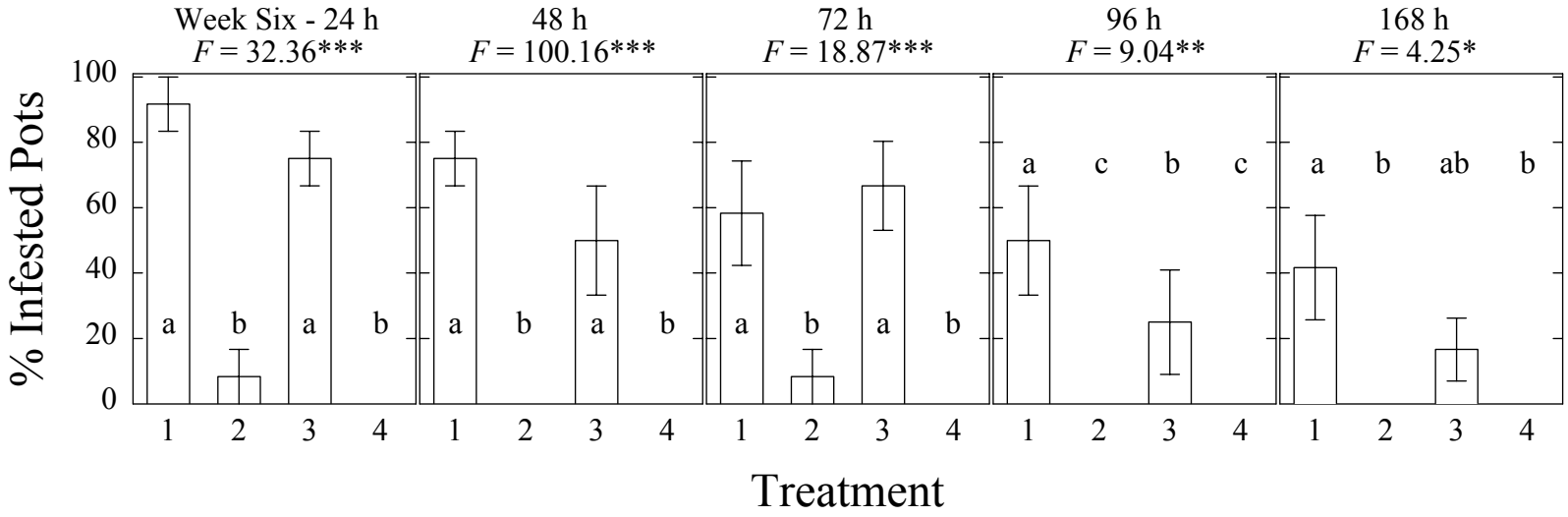

Figure 5. Mean (± SEM) percentage of pots infested with fire ants following introduction of ants to treated containers. Treatments were (1) an untreated control, (2) Talstar, (3) *Beauveria bassiana*, (4) or reduced rate of Talstar + *B. bassiana*. For each sampling date, bars with same letter are not significantly different (LSD, $P > 0.05$). *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; NS, not significant.

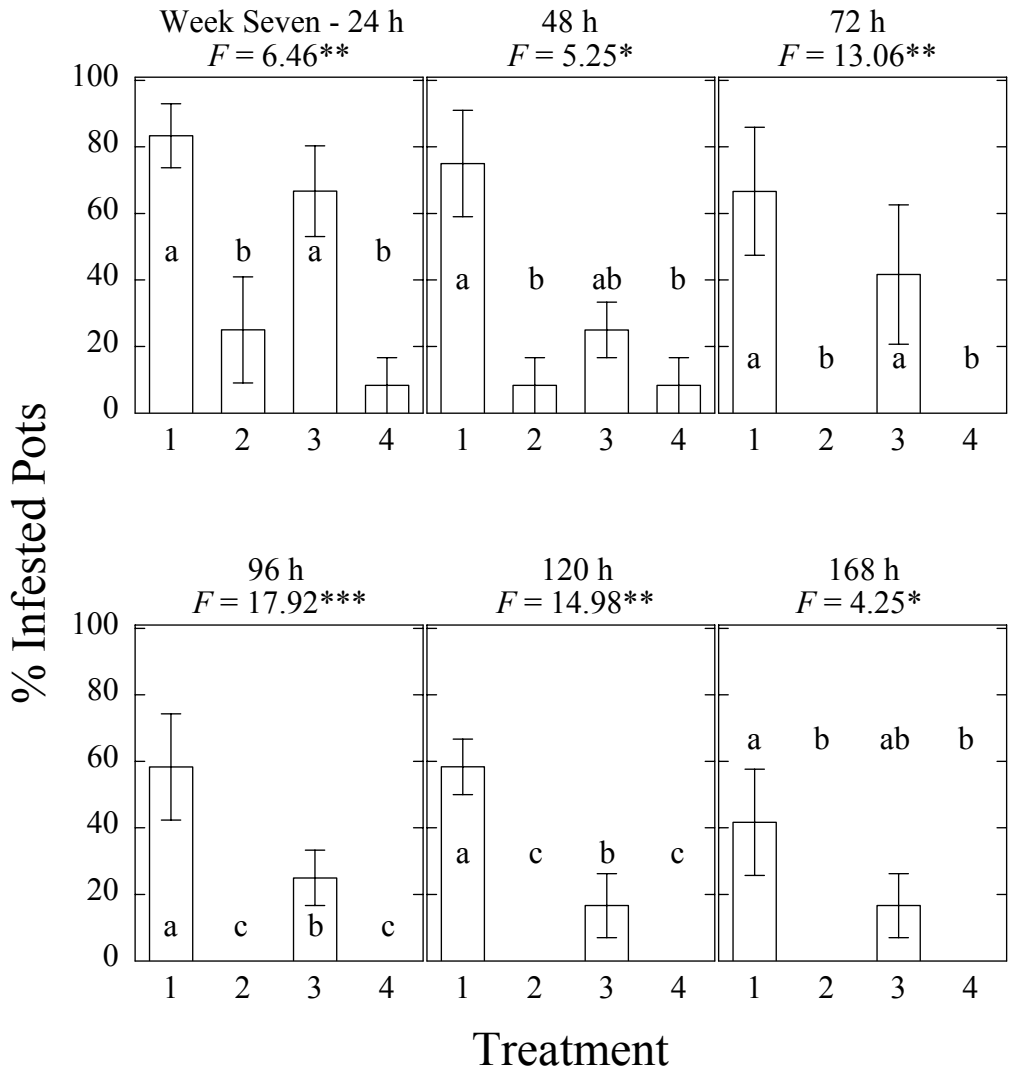

Figure 6. Mean (± SEM) percentage of pots infested with fire ants following introduction of ants to treated containers. Treatments were (1) an untreated control, (2) Talstar, (3) *Beauveria bassiana*, (4) or reduced rate of Talstar + *B. bassiana*. For each sampling date, bars with same letter are not significantly different (LSD, $P > 0.05$). *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; NS, not significant.