

SUNFLOWER TRIALS REPORT 2023

Introduction:

The goal of these trials was to estimate the efficacy of the Twin-N application, in a fully replicated study in 2-on-farm field trials, on growth and yield of Sunflower and Sweet corn under Hawaii's condition. The trials evaluate the effect of Twin-N application on reducing the N fertilizer application by 25% on the growth (Additional treatment with TwinN+100 nitrogen was added), crop yield and nitrogen availability within the crop root-zone was tested. The results were similar under both varieties.

Materials and Methos:

Three on-farm field trials were conducted using TwinN. Two on-farm trials were conducted on Oahu Island and 1 trial was conducted on Maui Island. In each trial, TwinN was applied with 75% and 100% nitrogen application and compared to 100% nitrogen application without TwinN. Each field trial was conducted with 5 replications. In the trials two sunflower varieties (for seeds and oil purposes) were tested. Small seed variety called "Black Peredovik" and large seeds variety called "Mongolian Giant" (Figure 1) were used in the trials.

Soil samples were collected from around the sunflower root-zone at the beginning, middle, and end of the growing season. Soil samples were analyzed for nitrate ($\text{NO}_3\text{-N}$). The Sunflower desks were harvested when the seeds reached maturity (Figure 2). Sunflower desks were harvested and transferred to the lab in a cooler with ice-packs for data collection. Sunflower desk weight in ounces and diameter in inches were measured.



Figure (1): Black Peredovik (left) and Mongolian Giant (right) sunflower variety used in the trials.



Figure (2): Mature seeds harvested from the sunflower desks harvested from the trials.

Results and Discussion:

Sunflower yield:

Sunflower yield was increased under the application of 100% Nitrogen+TwinN by ~19% for Black Peredovik variety at the three locations compared to 100% nitrogen and 75% nitrogen+TwinN (Figure 3). The Black Peredovik variety varied between the locations, but the yield response to the application of TwinN was clear at each location.

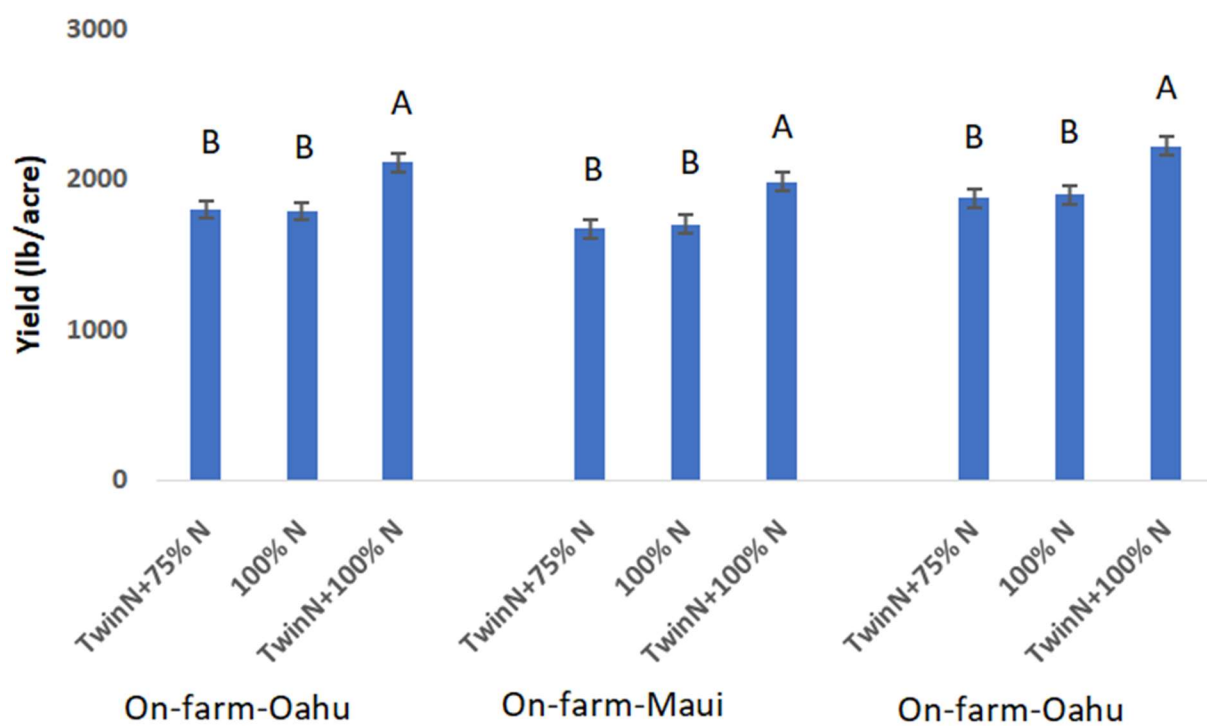


Figure (3): Sunflower yield (lb/acre) of snack/oil (Black Peredovik) variety tested at 3 on-farm locations (2 on Oahu and 1 on Maui).

The yield was increased numerically but not significantly under the 75% nitrogen+TwinN compared to 100% nitrogen at 2 locations of testing. The results suggest that the application of TwinN masked the reduction of nitrogen by 25% and significantly improved the yield of sunflower when combined by 100% nitrogen application (Figure 3).

Sunflower yield of the Mongolian Giant variety results at the 2 locations showed a significant increase by 24% under the 100% nitrogen+TwinN treatment compared to the 100% nitrogen and 75% nitrogen+TwinN. There was no significant difference between the 100% nitrogen and 75% nitrogen+TwinN (Figure 4). The Mongolian Giant yield was numerically similar under all locations.

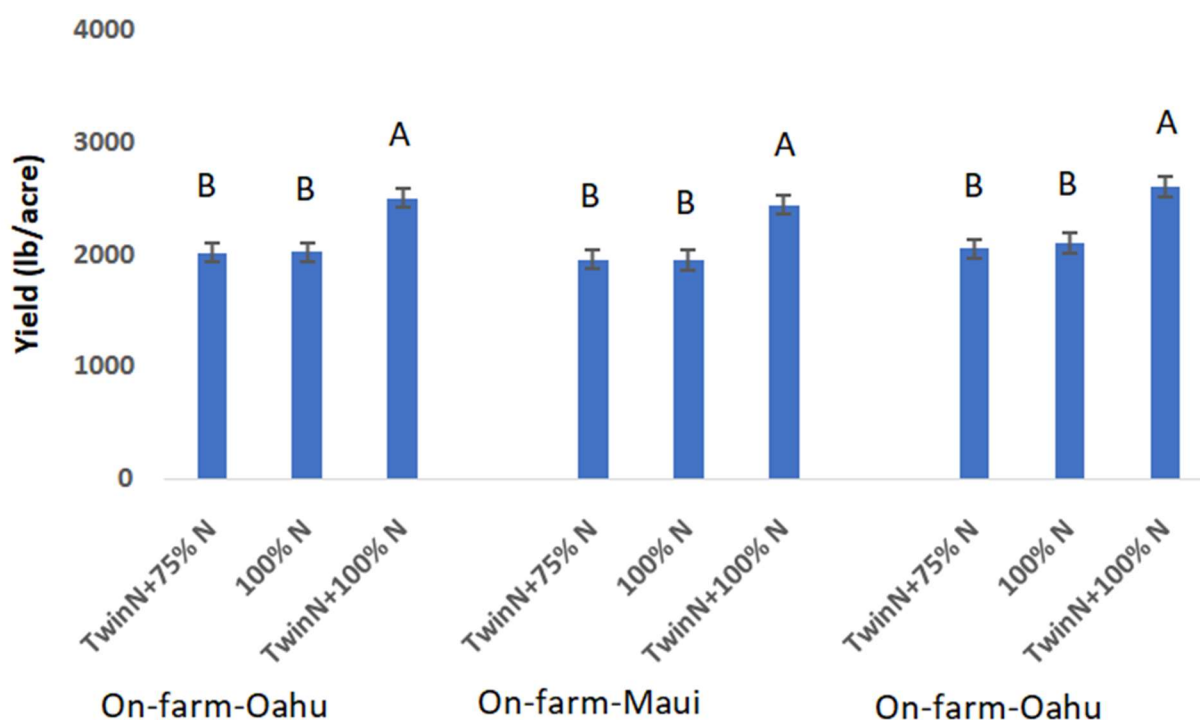


Figure (4): Sunflower yield (lb/acre) of snack/oil (Mongolian Giant) variety tested at 3 on-farm locations (2 on Oahu and 1 on Maui).

Sunflower desk weight:

Sunflower “Black Peredovik” variety desk weight was increased significantly with the application of TwinN+ 100% nitrogen. Also, there was no significant difference between 100% nitrogen and TwinN+75% nitrogen application (Figure 5). The results suggest that the application of TwinN covered for the 25% reduction in nitrogen application and caused increase in yield when applied with 100% nitrogen.

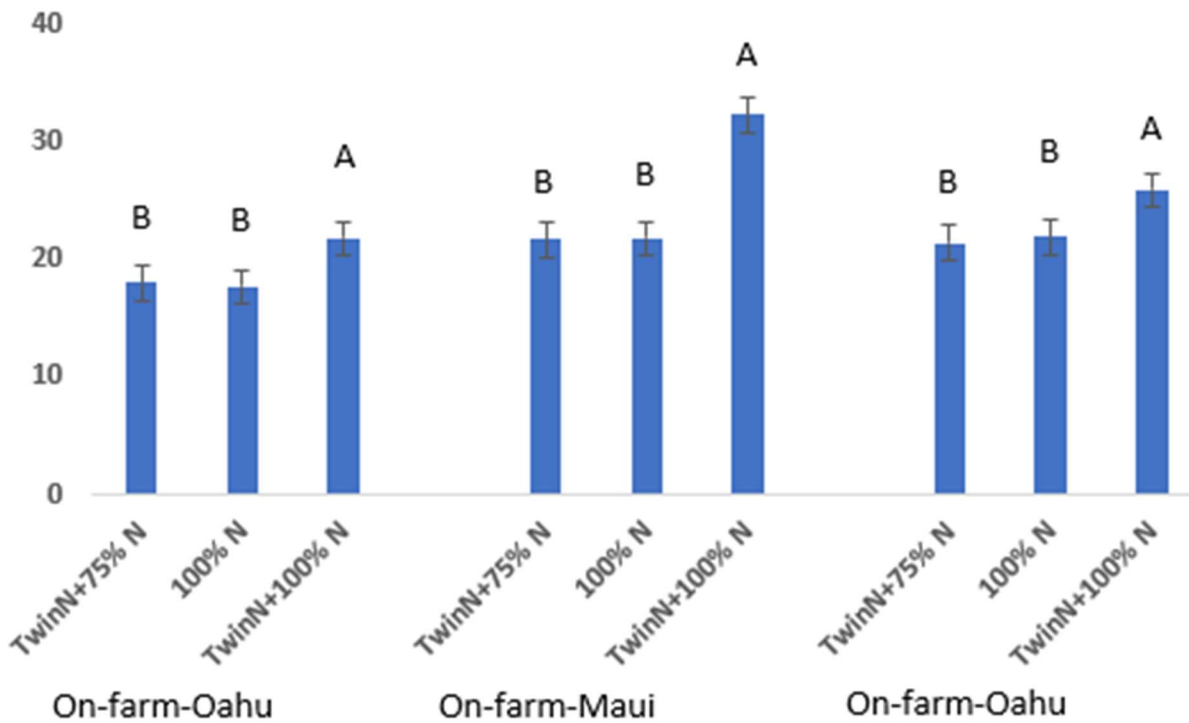


Figure (5): Sunflower desk weight (oz) snack/oil (Black Peredovik) variety tested at 3 on-farm locations (2 on Oahu and 1 on Maui).

The treatment did not impact the seed size, which is generally genetics, but the number of seeds from each sunflower desk was increased with larger sunflower desks under TwinN+100% nitrogen application. There was difference between 100% nitrogen and TwinN+75% nitrogen application (Figure 6).



Figure (6): Sunflower desks (Black Peredovik) variety harvested under TwinN+75% N (left), 100% N (middle) and TwinN+100%N (right) application.

Sunflower “Mongolian Giant” variety desk weight was increased significantly with the application of TwinN+ 100% nitrogen (Figure 7) compared to control treatment (100% nitrogen). There was no significant difference between 100% nitrogen and TwinN+75% nitrogen application (Figure 8). The results suggest that the application of TwinN covered for the 25% reduction in nitrogen application and caused increase in yield when applied with 100% nitrogen.

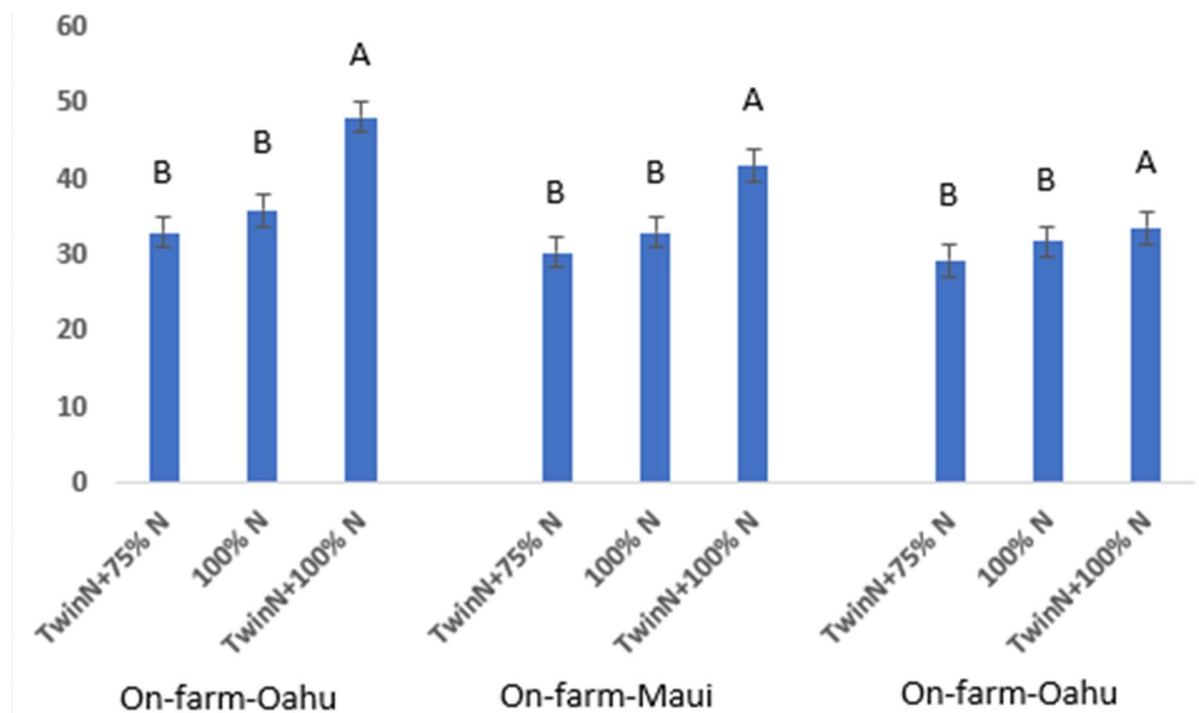


Figure (7): Sunflower desk weight (oz) snack/oil (Mongolian Giant) variety tested at 3 on-farm locations (2 on Oahu and 1 on Maui).



Figure (8): Sunflower desks (Mongolian Giant) variety harvested under TwinN+75% N (left), 100% N (middle) and TwinN+100%N (right) application.

Sunflower Desk Diameter:

Sunflower desk diameter was increased significantly under the application of TwinN+100% nitrogen compared to control treatment (100% nitrogen) application (Figure 9).

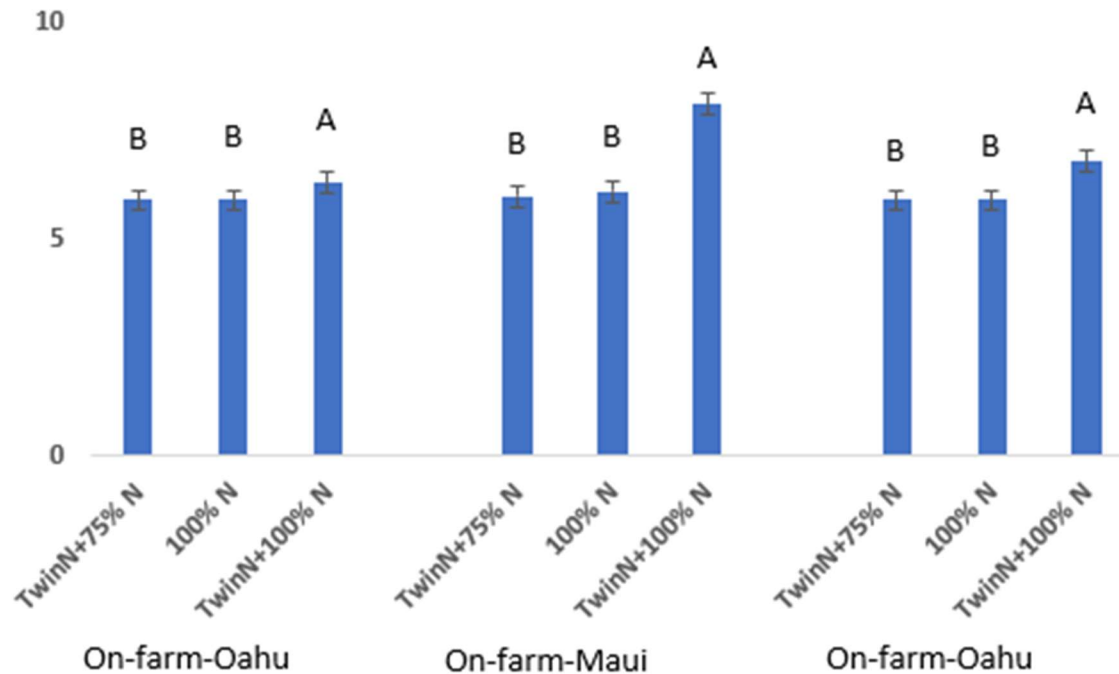


Figure (9): Sunflower desk diameter (in) from Black Peredovik variety tested at 3 on-farm locations (2 on Oahu and 1 on Maui). Also, there was no significant difference between the control (100% nitrogen application) treatment and TwinN+75% nitrogen application (Figure 10).



Figure (10): Sunflower desks diameter in Black Peredovik variety harvested under TwinN+75% N (left), 100% N (middle) and TwinN+100%N (right) application.

Sunflower disk diameter under “Mongolian Giant” variety increased significantly under the application of TwinN+100% nitrogen compared to 100% nitrogen application (Figure 11). Also, the results showed that there was no significant difference between the control (100% nitrogen application) treatment and the reduced nitrogen application (TwinN+75% nitrogen) with TwinN application (Figure 12). The results suggest that TwinN have increased the Sunflower disk diameter with the application of 100% nitrogen. It also helped to cover the reduce in nitrogen application by 25%. The results were similar under the two varieties and under both islands conditions. Hawaii is a small in area, but it’s know for its micro-climates. The results showed that TwinN application worked similarly (with some numeric differences) between the 3 locations on-farm trials used to conduct the sunflower trials.

Figure (13) showed that the average nitrate ($\text{NO}_3\text{-N}$) concentration within the crop root-zone was significantly higher under the application of TwinN+100% nitrogen compared to the control treatment (100% nitrogen). The application of TwinN with reduced nitrogen by 25% (75% nitrogen application) have helped in increasing the nitrate ($\text{NO}_3\text{-N}$) concentration within the crop root-zone and there was no significant difference with the 100% nitrogen application (control treatment). Also, there was a significant increase in the $\text{NO}_3\text{-N}$ concentration within the crop root-zone compared to the control treatment (100% nitrogen).

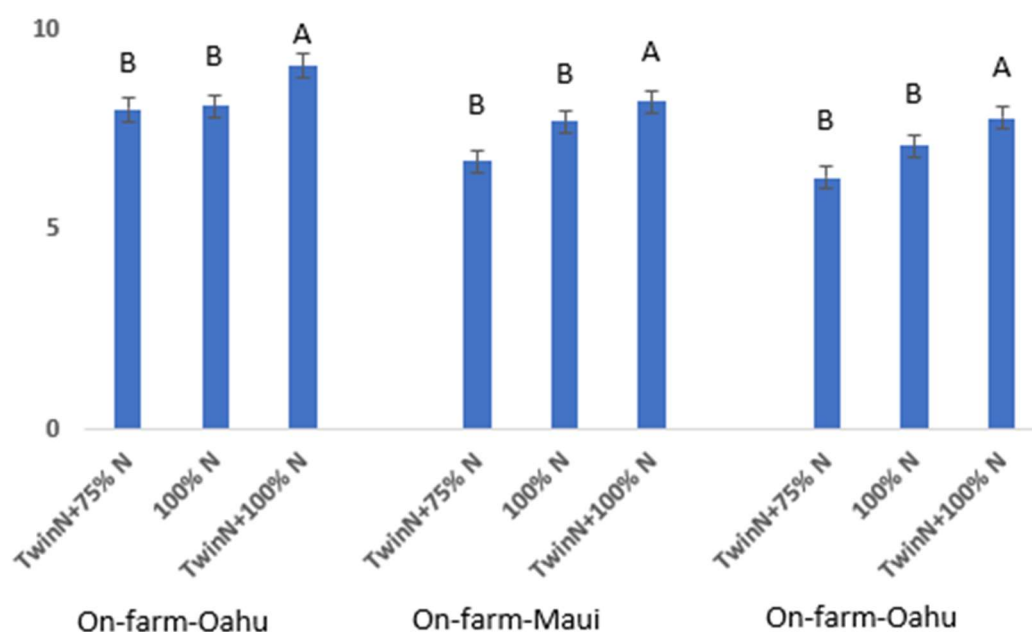


Figure (11): Sunflower disk diameter (in) from Giant Mongolian variety tested at 3 on-farm locations (2 on Oahu and 1 on Maui).



Figure (12): Figure (7): Sunflower desks diameter in Giant Mongolian variety harvested under TwinN+75% N (left), 100% N (middle) and TwinN+100%N (right) application.

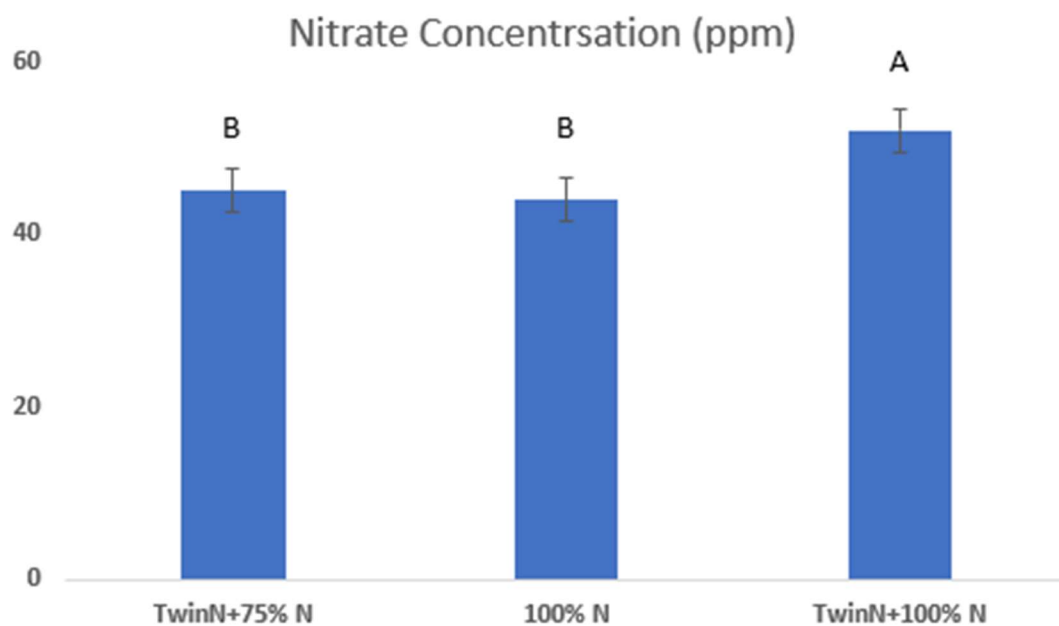


Figure (13): Nitrate ($\text{NO}_3\text{-N}$) concentration under TwinN+75% N, 100% N, and TwinN+100%N application.