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EVALUATING NEW SWEET CORN VARIETIES FOR MAIZE DWARF VIRUS (MDV) RESISTANCE UNDER HAWAII CONDITION

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Sweet Corn Globally and in Hawaii:

Corn ("Zea mays"), a cornerstone of global agriculture, is one of the most versatile crops in the world, cultivated in diverse climates and soil types—from Alaska to Argentina. Of the three main types of corn—sweet corn, field corn, and popcorn—our focus is on sweet corn, a staple enjoyed fresh from the stalk. In Hawai'i, sweet corn faces unique challenges due to the tropical climate, where heat, humidity, and disease pressure issues not typically encountered in temperate regions.

The University of Hawai'i, under the pioneering work of Dr. James Brewbaker, developed "Hawaiian Supersweet #9" specifically to address these challenges. This open-pollinated variety has been tailored for Hawai'i's tropical environment, emphasizing resilience against common diseases like maize dwarf mosaic virus (MDV) and maize chlorotic mottle virus (MCMV). It balances sustainability, yield, and disease tolerance, making it a vital asset for local farmers and gardeners. **However, there's a lack of seed availability and quality decline issues due to a lack of breeding program to maintain quality of the Supersweet #9.**

MCMV & MDV Diseases in Sweet Corn:

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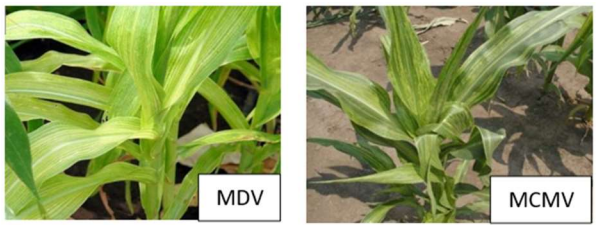
Maize dwarf mosaic virus (MDMV or MDV) and maize chlorotic mottle virus (MCMV) are major threats to sweet corn, particularly in tropical regions like Hawai'i.



Maize Dwarf Mosaic Virus (MDMV): Maize Dwarf Mosaic Virus (MDMV): Infections result in stunted plants, reduced ear size, and potential partial or complete yield loss. Aphids transmit the virus so rapidly that insecticides often cannot prevent its spread. Preventive strategies include planting resistant varieties and timing sweet corn planting to avoid peak aphid populations.

Maize Chlorotic Mottle Virus (MCMV): This virus infects maize and other monocotyledon plants through seeds, mechanical means, and vectors such as whiteflies, leafhoppers, thrips, and aphids. It can also spread through infected soil. Symptoms range from mild mottling to severe mosaic patterns and developmental delays. While no sweet corn varieties are fully resistant to MCMV, varieties, like Supersweet #9, exhibit some tolerance. Recommended practices to prevent the infection includes:

-Selecting disease-tolerant varieties.

-Implementing crop rotation to disrupt disease cycles.

-Applying integrated pest management (IPM) practices, including the use of organic or synthetic insecticides to control vector populations.

This study evaluates the performance of MDV - resistant varieties under Hawai'i's conditions, aiming to enhance tolerance to MCMV and support sustainable agriculture in the Hawaii.

Evaluating New Sweet Corn Varieties:

Nine new sweet corn varieties were tested for their suitability to Hawai'i at two locations: Hawai'i Kai and Waimanalo Research Station. The varieties, obtained from Stokes Seeds, were selected for their MDV resistance and expected tolerance to MCMV, these included were: **Venture, Inspiration, Patriarch, Resolve, Freedom, Whitaker, Temptress, Obsession, and Nicole**, which were compared against the local Hawaiian variety "Supersweet #9 Yellow".

Trials Methods:

Planting: Direct seeding was conducted in June 2024 for both sites using a jabber, with seedlings protected by screen nets to prevent damage/feeding from birds.

Irrigation: A drip irrigation system was employed, initially set to 30 minutes twice daily, then reduced over time to three days per week.

Fertilization: Fertilizer applications were guided by soil testing, with nitrogen applied at a rate of 150 lbs N/acre.

Agronomic Practices: Weeding and other treatments were performed according to site-specific requirements.

Growth/Harvest: Varieties were harvested between July 25–30 for the hybrid varieties and August 17 for the Supersweet #9. A growth period of 55–60 and 78 days for the hybrid varieties and Supersweet#9, respectively.

Open Pollination vs. Hybrid Sweet Corn:

All nine new varieties tested were hybrids (F1 generation), meaning seeds collected from these varieties after maturity will not reproduce true-to-type. Hybrid seeds often revert to their parent characteristics, losing traits such as disease resistance, sweetness, or yield potential. This limitation underscores the value of open-pollinated varieties like Supersweet #9 for sustainable agriculture. However, continuous variety improvement in open pollination varieties is needed as well to maintain quality.

Results and Discussion:

The nine hybrid varieties varied in their ear size, seed color, and sweetness. However, they all matured within 55-60 days from planting and they were all shorter than the Hawaiian varieties. However, they were all sweeter than the Hawaiian varieties. No incidents of MCMV or MDV were recorded (note: Insecticides for vector pest were applied once at the beginning of the growing season). Additionally, Bacillus thuringiensis (BT) was applied for corn earworms. The figure below shows the corn ears harvested from each variety in order: Venture, Inspiration, Patriarch, Resolve, Freedom, Whitaker, Temptress, Obsession, and Nicole, respectively.

In general, the 10 varieties performed similarly at both testing sites (Waimanalo and Hawaii Kai) with slight (not significant) difference in yield. The ears with husk varied between 8-11 ounce and 8.3-12.7 ounce, in Waimanalo and Hawaii Kai, respectively (Figure 1-2).

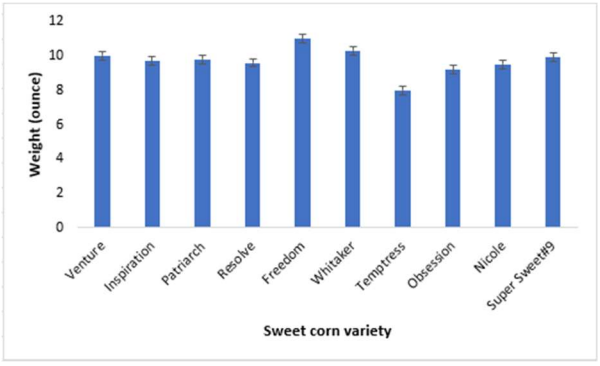


Figure (1): Sweet corn ears (with husk) weight at Waimanalo Research Station.

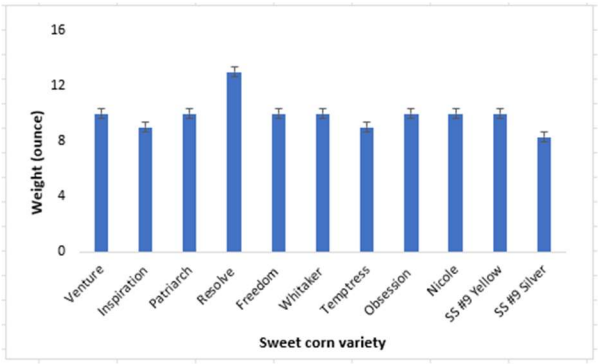


Figure (2): Sweet corn ears (with husk) weight at Hawaii Kai site.

The weight of corn ears without husk varied between 6.5-9.0 ounce and 6.1-10.2 ounce, in Waimanalo and Hawaii Kai, respectively (Figure 3-4), with higher performance in Hawaii Kai site.

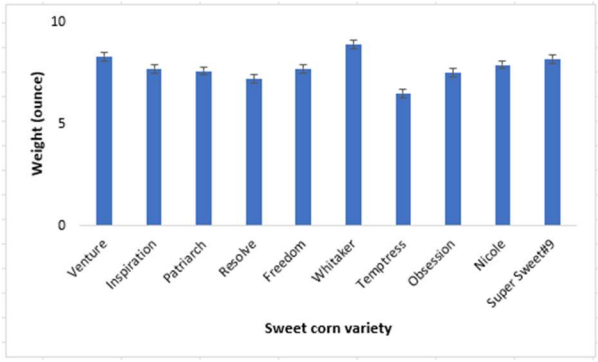


Figure (3): Sweet corn ears (without husk) weight at Waimanalo Research Station.

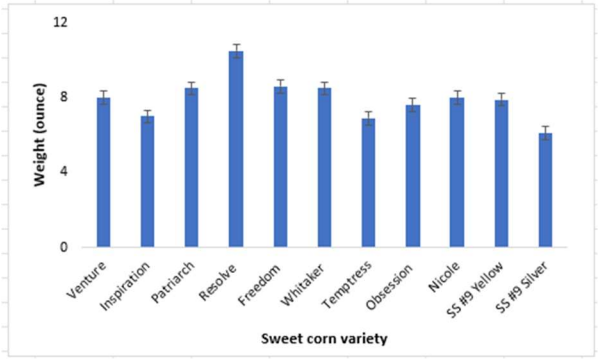


Figure (4): Sweet corn ears (without husk) weight at Hawaii Kai site.

The corn ears length varied between 7.0-9.0 inch and 7.5-10.0 inch, in Waimanalo and Hawaii Kai, respectively (Figure 5-6).

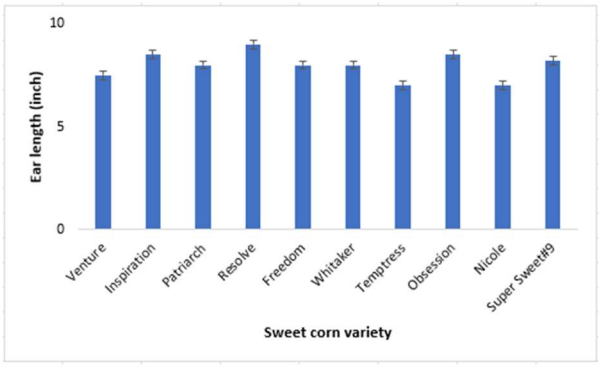


Figure (5): Sweet corn ears length at Waimanalo Research Station.

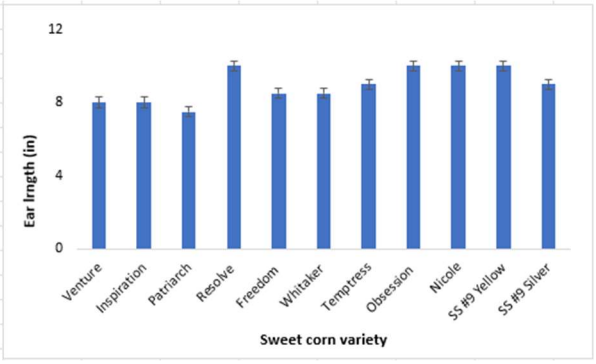


Figure (6): Sweet corn ears length at Hawaii Kai site.

The sweet corn sweetness (BRIX) showed greater difference between the two testing sites. The corn ears sweetness varied between 10.5-14.3 and 12.3-18.1, in Waimanalo and Hawaii Kai, respectively (Figure 7-8). Also, all the hybrid varieties were sweeter than the local Hawaiian SuperSweet #9 at both testing sites.

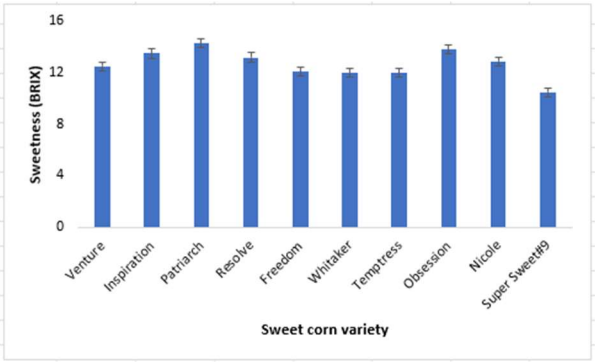


Figure (7): Sweet corn ears sweetness (BRIX) at Waimanalo Research Station.

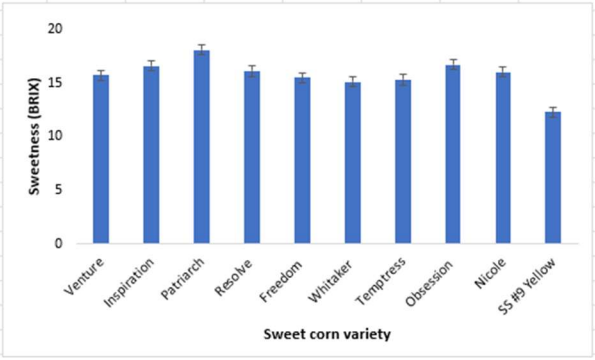


Figure (8): Sweet corn ears sweetness (BRIX) at Hawaii Kai site.

Conclusion:

The sweet corn hybrid varieties can provide additional options for the local growers to adopt, especially in areas with high MCMV/MDV infection incidents.

Also, it's expected that the hybrid varieties will perform the best during Summer growing season and may not perform well in other seasons. The need to improve the local Hawaiian varieties or find a long-term replacement is needed for the sustainability of sweet corn production in Hawaii.

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