Response of Fiber and Floral Hemp under Different Water Regimes

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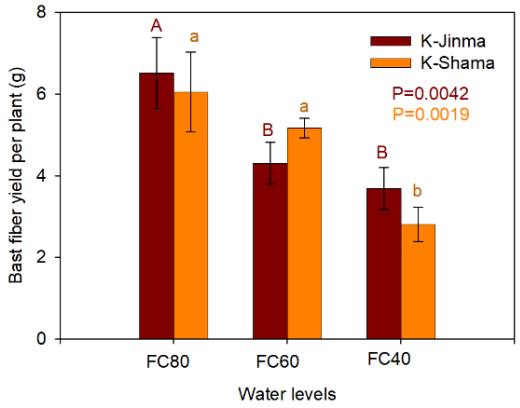
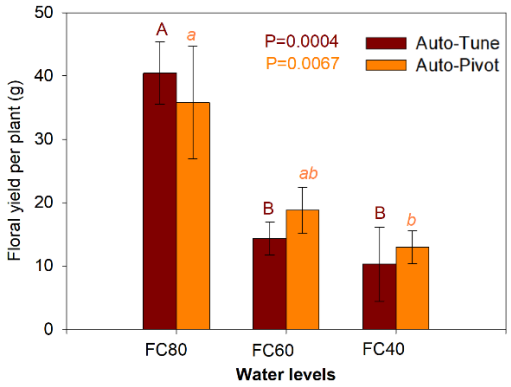
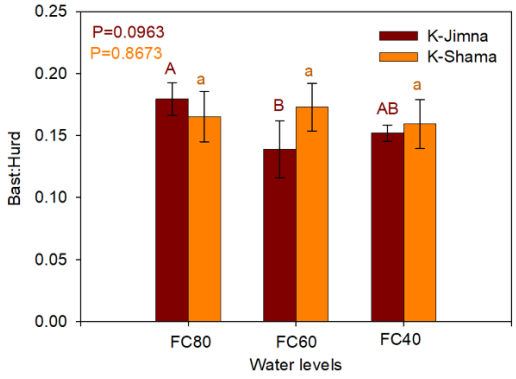
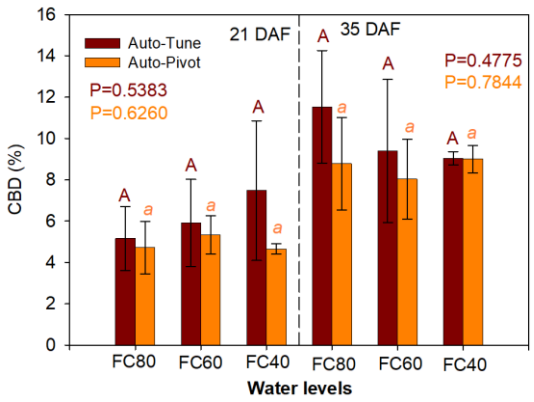
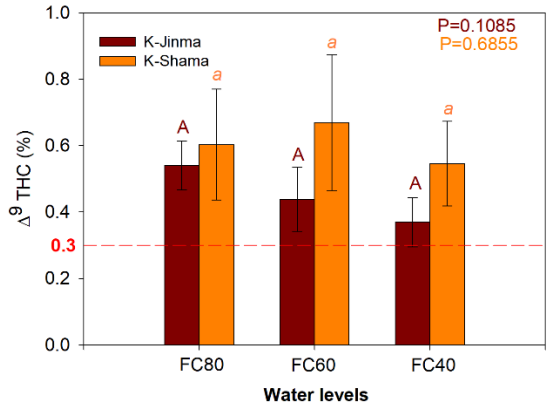
Hemp (*Cannabis sativa* L.) containing less than 0.3% Δ^9-tetrahydrocannabinol (THC), is primarily cultivated for its fiber, seeds and medicinal properties. A pot experiment was conducted in the greenhouse at the MSU Upper Peninsula Research and Extension Center (MSU-UPREC) to assess the effects of different water regimes, 80%, 60%, and 40% field capacity (FC), on two fiber (*K-Jinma and K-Shama*, Kanda Hemp) and two floral (*Auto-Tune and Auto-Pivot*, Beacon Hemp) hemp cultivars. Seeds of both types were sown on June 11th, 2025 with nine and two seeds per pot initially, and then thinned periodically to three and one seedlings per pot for fiber and floral types, respectively. The pots (10 × 11 inches (diameter × height)) were filled with soilless media (VeggieDoo 301, Morgan's Composting, 4 kg/pot with ≈ 26% initial moisture) with six pots per treatment (replicates) and eight extra pots per treatment (to destructively estimate soil moisture on weight basis). The water treatments were initiated on July 11th, 2025 (for floral type) and July 17th, 2025 (for fiber type). Pots and plants were weighed weekly and irrigated accordingly to maintain the treatments. Fertilizer (Espoma Organic Garden-tone, 3-4-4) was applied to fiber types at 22.5 g per pot. The plants were sampled at 21 and 35 days after flowering (DAF) for floral types and 15 and 30 days after treatment (DAT) for fiber types. Our moisture treatments had significant effects on hemp morphology and yield, but not quality. Specifically, bast fiber and hurd yields of both fiber cultivars were significantly lower ($P<0.05$) at FC40 than FC60 and FC80. However, drought stress did not have a significant effect on bast:hurd ratio or THC concentration of fiber types. Regarding floral types, floral yield was substantially reduced at FC40 and FC60 as compared to FC80. Similar to fiber types, drought stress did not have a consistent discernable effect on cannabidiol (CBD) or THC concentration. However, CBD and THC concentrations were numerically higher (>0.3% THC) under FC40 at 21DAF as compared to FC60 and FC80. Overall, the FC40 treatment was found to be yield limiting for fiber and floral hemp, with auto-flowering floral cultivars showing more drought sensitivity than fiber cultivars.

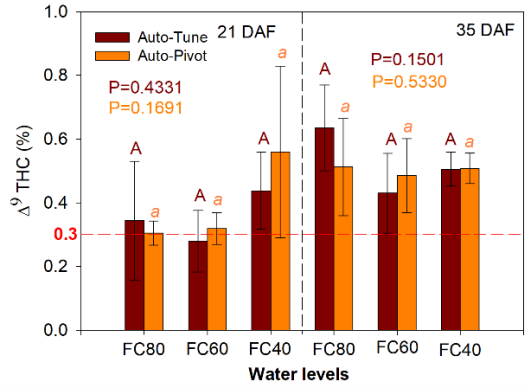

Bast fiber yield per plant (g)
K-Jinma
K-Shama
P=0.0042
P=0.0019
A
a
B
a
B
b
FC80
FC60
FC40
Water levels

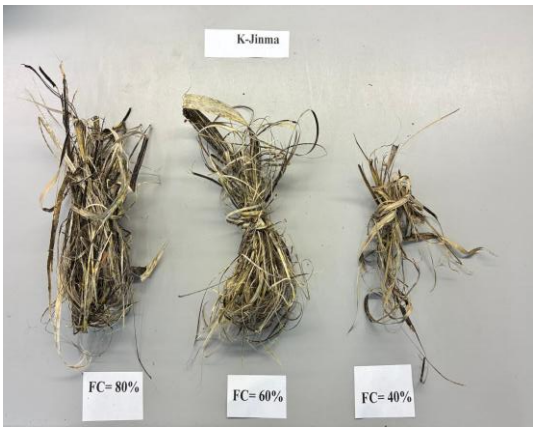

Floral yield per plant (g)
P=0.0004
P=0.0067
Auto-Tune
Auto-Pivot
A
a
B
ab
B
b
FC80
FC60
FC40
Water levels

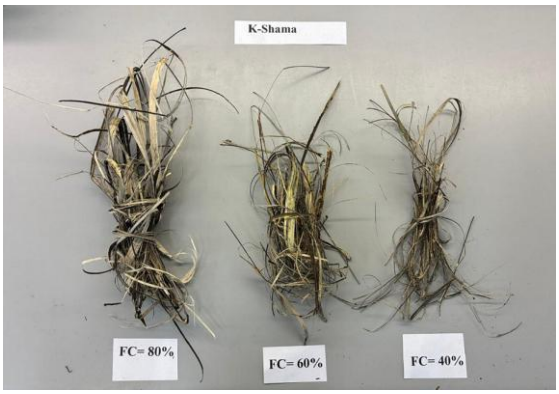

Bast:Hurd
P=0.0963
P=0.8673
K-Jimna
K-Shama
A
a
B
a
AB
a
FC80
FC60
FC40
Water levels


CBD (%)
Auto-Tune
Auto-Pivot
21 DAF
35 DAF
P=0.5383
P=0.6260
P=0.4775
P=0.7844
FC80
FC60
FC40
FC80
FC60
FC40
Water levels


Δ9 THC (%)
K-Jinma
K-Shama
P=0.1085
P=0.6855
0.3
FC80
FC60
FC40
Water levels


Δ9 THC (%)
Auto-Tune
Auto-Pivot
21 DAF
35 DAF
P=0.4331
P=0.1691
P=0.1501
P=0.5330
0.3
FC80
FC60
FC40
FC80
FC60
FC40
Water levels





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