

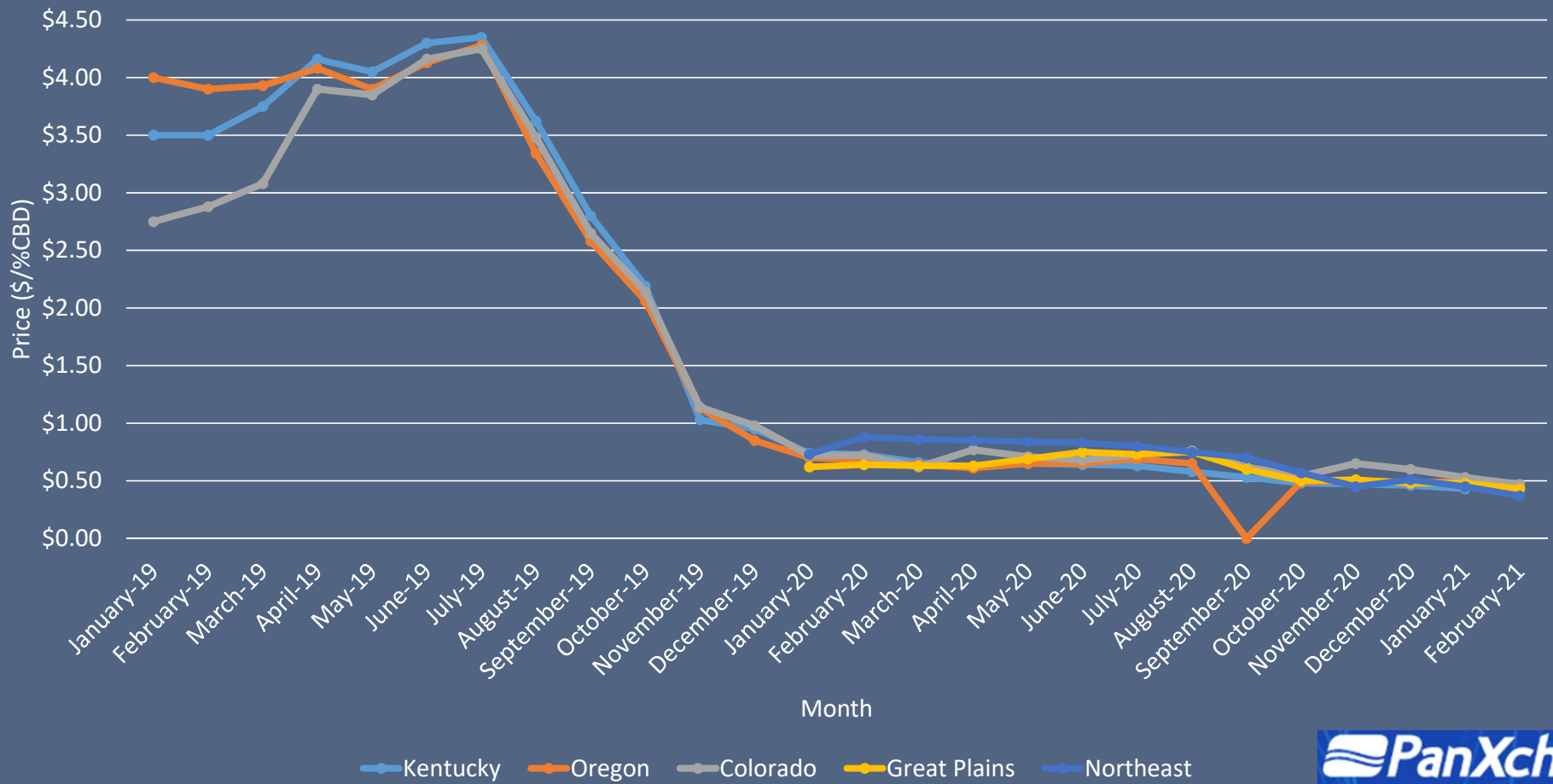
“Modern” Era of Hemp

- 2014 Farm Bill
 - Allowed states to conduct “research” on hemp if permitted under state laws.
 - Hemp defined as *Cannabis sativa* with < 0.3 % Δ9 THC.
 - KDA requires all growers to register with planned locations for growing hemp.
 - Universities were encouraged to begin production research.
 - Hemp still federally considered as a schedule 1 substance.
- 2018 Farm Bill
 - Removed hemp from schedule 1 status
 - Still requires the states to have a plan for licensing growers and monitoring production
 - Directed USDA-AMS to develop a regulatory structure.
 - Final Rule on Hemp published January 2021

Growth of Hemp Crops in Kentucky

KDA Industrial Hemp Research Pilot Program												
Annual Overview												
Production Year	# University Projects	Approved Processors	Approved Growers	KY Counties with Hemp	Approved Acres	Planted Acres	Harvested Acres	% Grain or Seeds	% Fiber	% CBD / other Cannabinoids	% Grain & CBD	% Seed & Fiber
2014	7	9	20	14	-	33	-	47%	32%	21%		
2015	8	29	99	41	1,742	922	500	47%	6%	47%		
2016	17	45	137	60	4,600	2,300	2,000	34%	6%	60%		
2017	17	49	204	71	12,800	3,200	2,300	36%	5%	27%	32%	
2018	14	72	210	73	16,100	6,700	6,000	18%	4%	61.5%	14%	2.5%
2019	12	200	978	102	60,000	26,500	24,900	2%	4%	92%	0	2%
Sept. 2020	12	170	970	113	32,000	5,000	TBD	1%	4%	95%	0	0

Biomass Price



Hemp Status

- The CBD “bubble” has burst
 - Huge over production
 - Market potential not developing as fast as predicted
 - Moderate potential for market growth
 - Niche markets (smokable flower)
- “Resurgence” in fiber and grain???
 - Can we get hemp/hemp by products approved as animal feed?
 - Can we get past the market supply/market demand loop?
 - Federal and Private funds flowing into research now.
- Expect to continue having a moving target w.r.t. regulation



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2021 KYHA Virtual Hemp Conference

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CBD & THC ACCUMULATION IN FLORAL HEMP CULTIVARS: IMPLICATIONS FOR COMPLIANCE TESTING AND HARVEST SCHEDULING

Disclaimers (the fine print)

- Regulations and interpretation of regulatory requirements may vary depending on the state or tribal hemp production plan.
 - Time of pre-harvest sampling
 - Sampling method
 - Analytical methods used
- Suggestions made in this presentation should not be construed as legal advice.
- Read and understand all national and local hemp regulations and consult a qualified attorney for legal advice.

Sampling Guidelines for Hemp U.S. Domestic Hemp Production Program Issued January 15, 2021

“Since the THC content of hemp generally peaks as the plant ripens, the timing of when sampling occurs is important to accurately measure total THC concentration and monitor compliance with the USDA hemp production program. Harvest shall be completed within **30 days** from sample collection.”

Regardless of the specific performance-based sampling requirements developed under a State or Tribal plan, all samples must be collected from the flowering tops of the plant by cutting the **top five to eight inches from the “main stem”** (that includes the leaves and flowers), “terminal bud” (that occurs at the end of a stem), ”or “central cola” (cut stem that could develop into a bud) of the flowering top of the plant.

Remediation and Disposal Guidelines for Hemp Growing Facilities: U.S. Domestic Hemp Production Program Issued January 15, 2021

2. Non-compliant hemp plants may be remediated by separating and destroying non-compliant flowers, while retaining stalks, leaves, and seeds.
3. Non-compliant hemp plants may be remediated by shredding the entire hemp plant to create “biomass.” All flowers, buds, trichomes, leaves, stalks, seed, and all plant parts from a lot should be chopped or shredded in such a way as to create a homogenous, uniform blend of the lot called “biomass.” Lots should be kept separate and not be combined during this process. **This biomass shall be resampled and retested to ensure the biomass material tests within an acceptable THC concentration level before it may enter the stream of commerce in accordance with §990.3(d) and §990.27(c).** If the biomass tests above the acceptable THC concentration level is non-compliant hemp and must be destroyed through one of the disposal options provided herein.

Cultivars, Timing and Compliance Testing

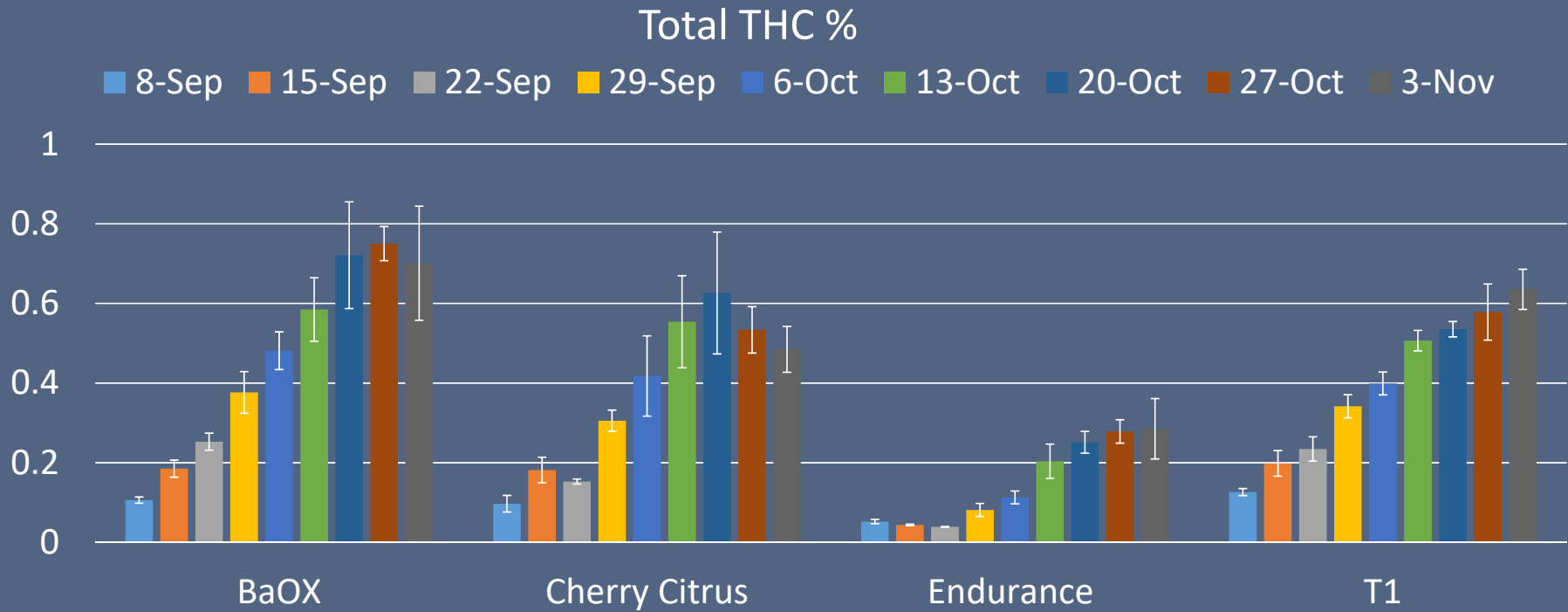


Weekly Compliance testing

- Began just after floral initiation in earliest cultivar
- Sampled same day every week
- Sampled 3 main terminal buds per plot 20cm (8 in) long
- Trichome staged after cutting
- Samples transported to KDA for drying at 70 C for 24 hours
- Samples taken to UK Regulatory Services for total THC and CBD by GC.

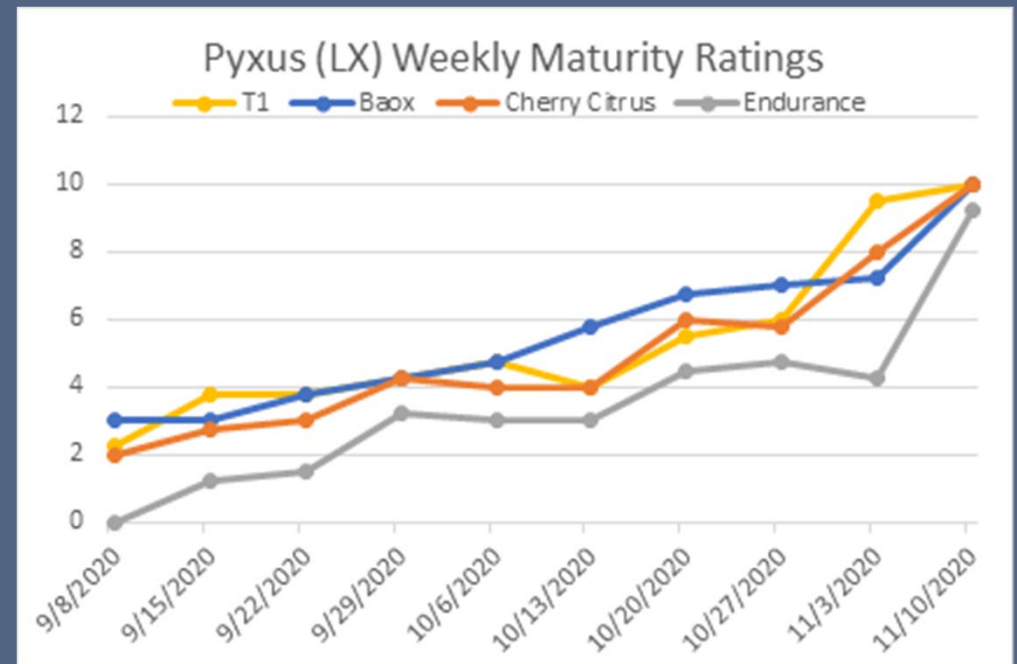


THC accumulation over time

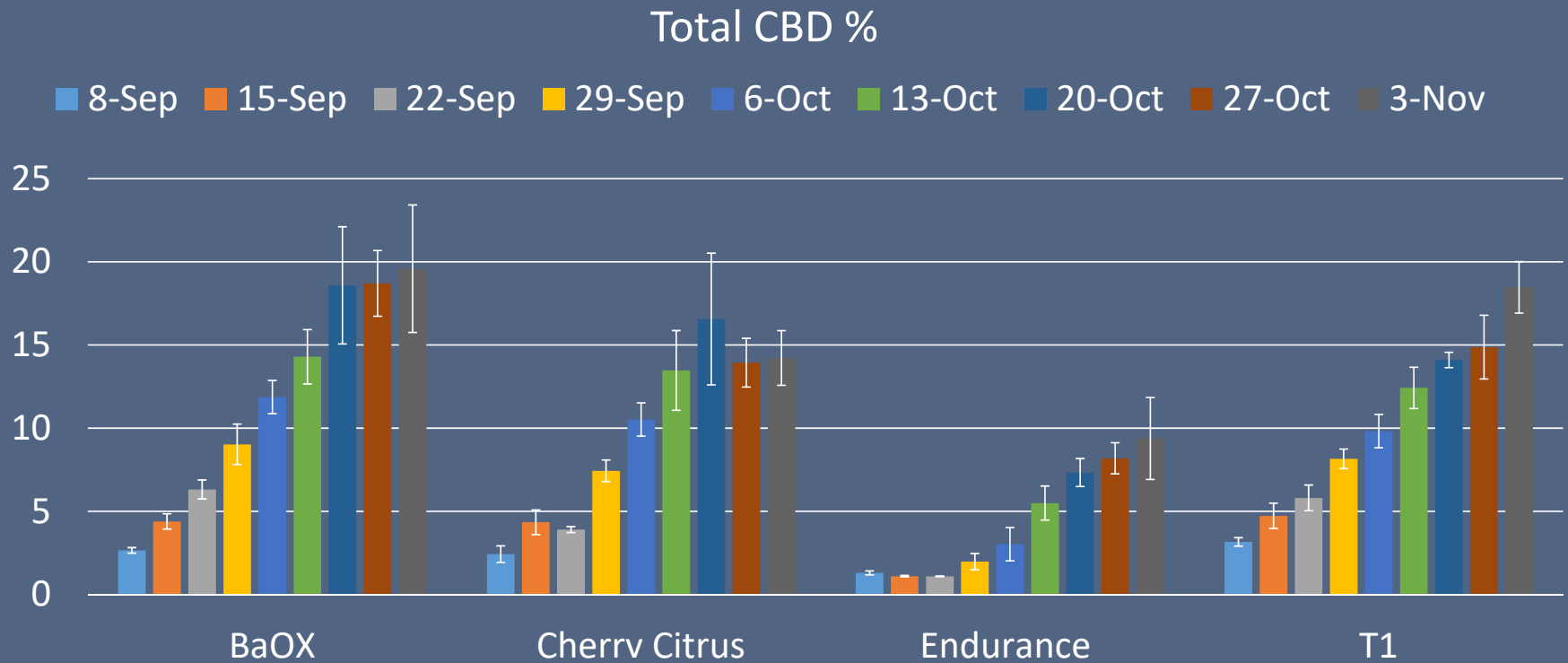


Harvest Scheduling with Trichome Secretion Color?

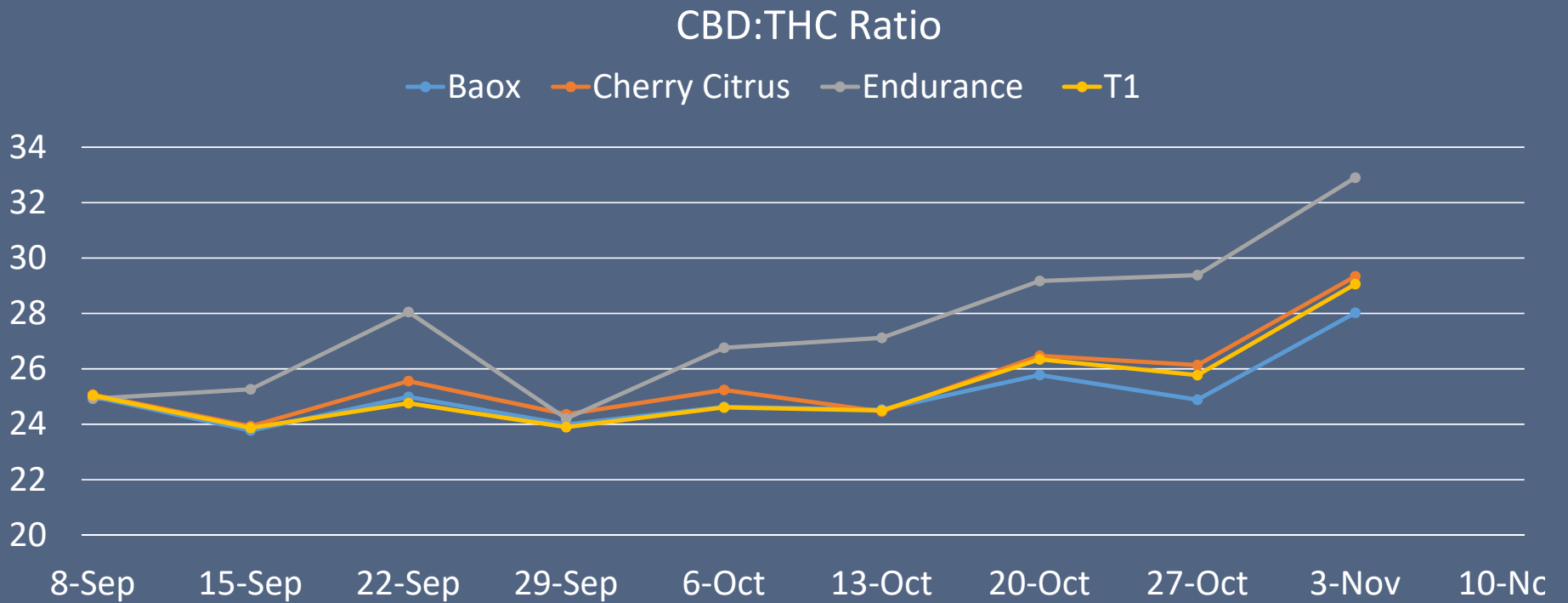
Rating	Trichome Density	Secretion Color
0	none	none
1	low	mostly clear
2	low to med	clear to opaque
3	med to high	< 10% amber
4	med to high	10 to 20 % amber
5	med to high	20 to 30% amber
6	high	30 to 40% amber
7	high	40 to 50% amber
8	high	50 to 60% amber
9	high	60+ % amber
10	necrosis	NA



CBD accumulation over time



CBD:THC ratio over time



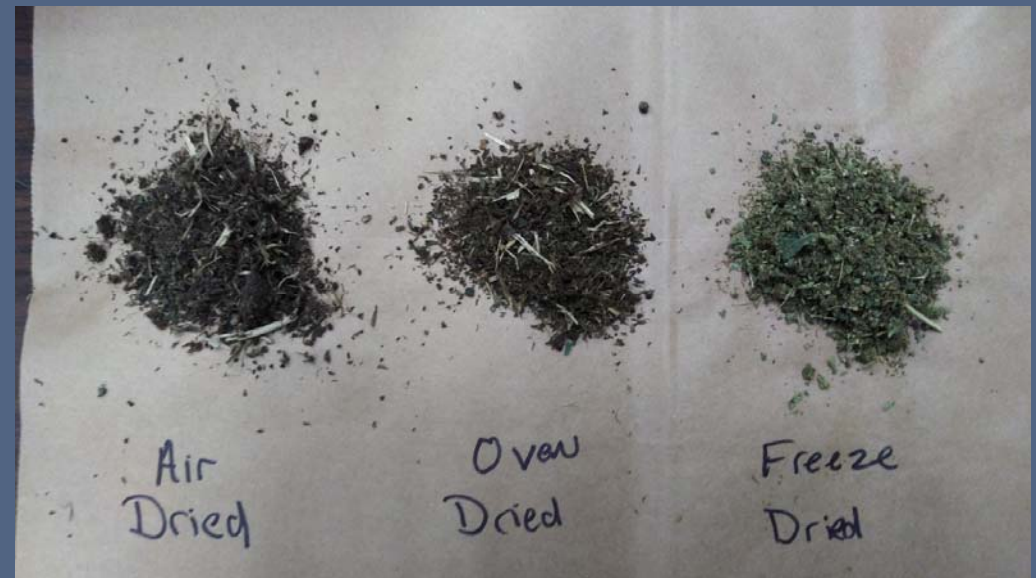
Remediation Potential: Example

- Baox Plots “harvested” 10/5 and 10/6
- Compliance samples on 10/6 averaged **0.48% THC**
 - Top 8 inches of terminal flower
- Harvest Protocol
 - Removed all leaves and floral material from plant
 - Did not include main stems and large branches
 - Material dried in crop dryer at about 125 F for 4 to 5 days
- Post-Harvest test on harvested material: **0.21% THC**
- CBD at compliance sample: 11.87%
- CBD in harvested material: 8.45%

Possible reasons for lower Cannabinoids in harvested materials

- Plant position
 - Main terminal may have higher level than lower branches
- Dilution
 - Inclusion of leaves and small stems pieces
- Degradation
 - Impact of drying treatment is unknown

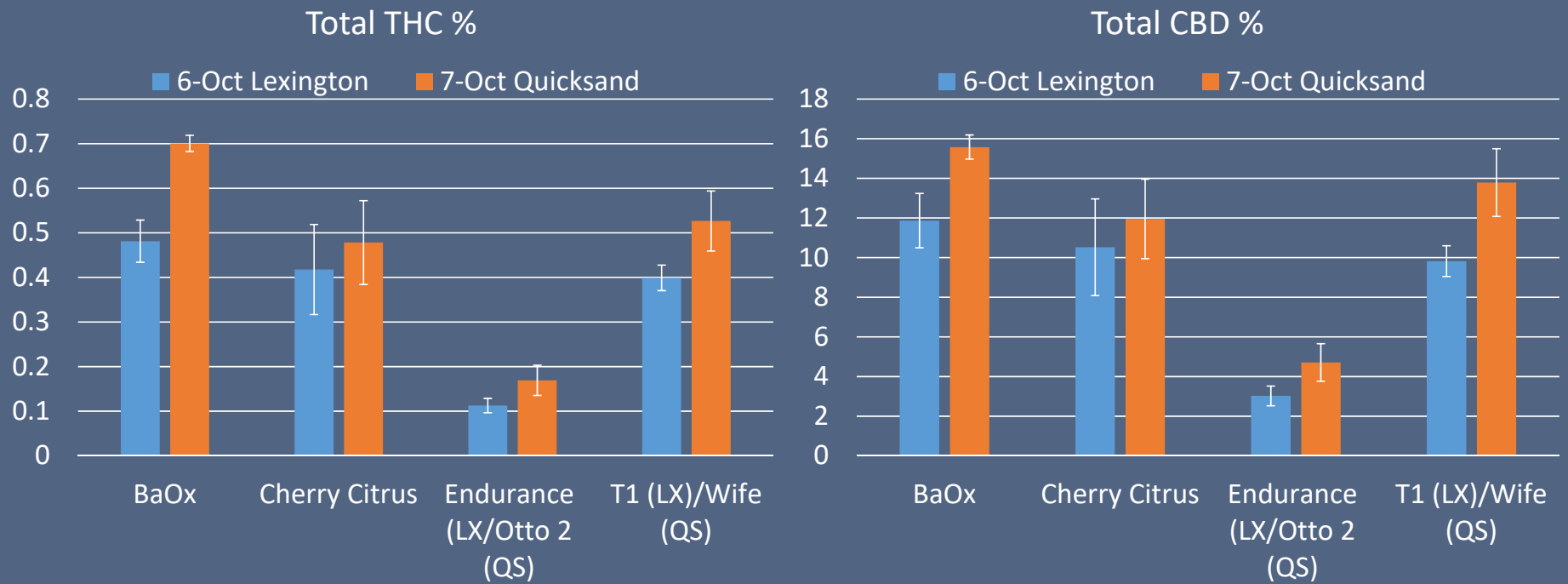
Total CBD: 6.122	4.724	6.569
Total THC: 0.219	0.114	0.312



Potential role of environment?



Growing conditions may also impact cannabinoid accumulation



Lexington site was planted June 17th and the Quicksand site was planted June 26th

Purple vs Green Phenotype

Cherry Citrus: September 18

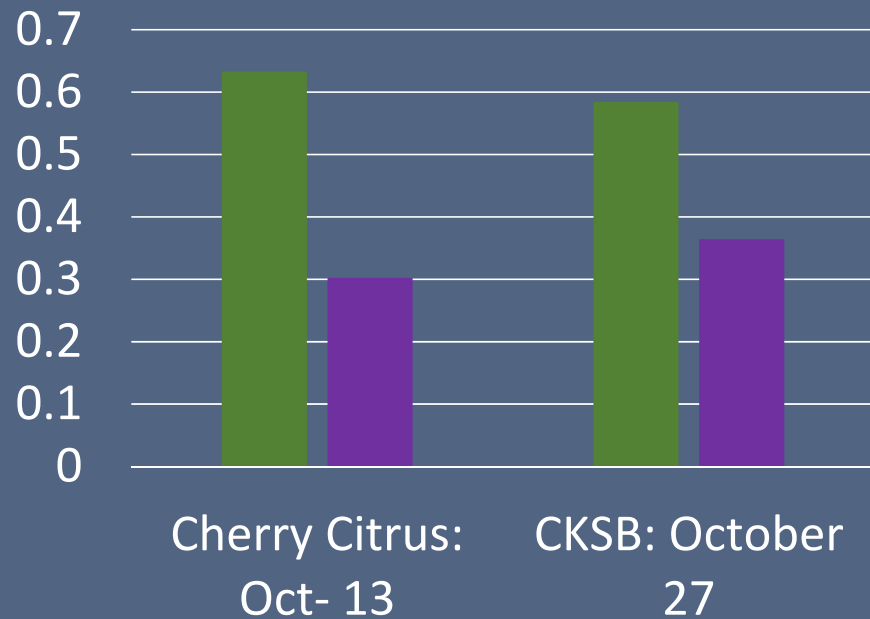


Cherry Citrus: October 12

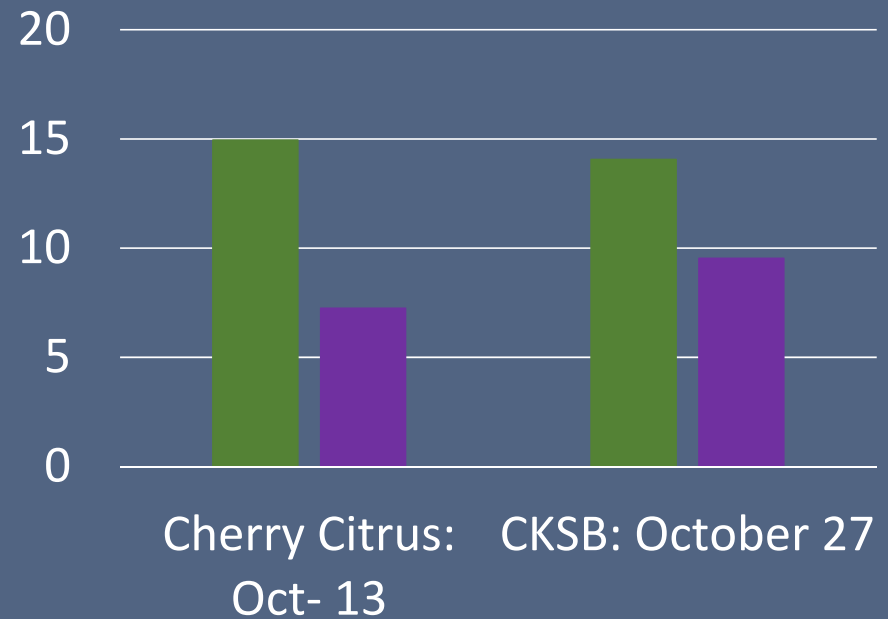


Purple vs Green Phenotype

Total THC %



Total CBD %



Factors For Growers To Consider for THC Compliance

- **Cultivar:**
 - Variation between cultivars
 - Variation within a cultivar
 - Look for cultivars with high CBD/THC ratio
- **Time:** both THC and CBD increase with maturity
- **Environment:** very little is known about these effects
 - Stress
 - Fertility
 - Soil type
- Carefully choose cultivars
 - Check COAs
 - Check third party sources
 - Kentucky Dept of Ag: Summary of varieties
- Monitor cannabinoid accumulation over time
 - Choose a reputable lab
 - Sample similar to regulatory compliance samples
- Monitor stress impact on cannabinoid levels

Acknowledgements:

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 - Edmond Thompson: Hemp Program Specialist



Thank you

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