

# 2020

## Annual Hemp Regulatory and Research Report



*Office of*

**Indiana State Chemist & Seed Commissioner**

**175 S. University Street**

**Purdue University**

Mark LeBlanc, Ph.D.  
State Chemist & Seed Commissioner

Donald B. Robison, MBA  
Seed Administrator

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## 2020 Hemp Production Report

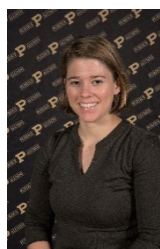
Presented here within is the 2020 Annual Hemp Report of the Office of Indiana State Seed Commissioner. It represents a summary of official inspectional activities related to hemp in Indiana, laboratory analyses performed on official samples collected under the authority of Indiana Hemp Law for hemp grown in Indiana as well as survey data collected in cooperation with Purdue Hemp Extension. The 2020 season was a research year and OISC and Purdue worked closely to gain valuable insight into this young industry. The Indiana Seed Law as it applies to hemp is a “truth-in-labeling” law requiring basic quality factors to be expressed to represent a level of quality to potential purchasers and consumers. The purpose of the law is to provide the consumers with adequate information, through fair and consistent labeling, to make intelligent purchases of agricultural and vegetable seed products. OISC has been in the lead nationally on requiring full labeling of hemp seed to protect the growers from dubious claims, weed seeds and low germination rates. For testing hemp seed, our office is a charter member of the Association of American Seed Control Officials (AASCO) and the Association of Official Seed Analysts (AOSA) and we abide by the rules and protocols established by those associations. With 51 hemp seed germination tests completed in the Indiana State Seed lab the results in 2020 averaged 55% germination. The inspection staff of the Indiana State Chemist and Seed Commissioner provides marketplace surveillance throughout the state through inspectional visits to hemp growers in Indiana. These growing areas consist of growth for CBD, fiber, grain, seed oil and seed as well as other uses. Samples are obtained through official sampling methods and are analyzed in the Indiana State Hemp Laboratory to determine compliance with legal THC limits. This report accurately reflects the dedication to our statutory responsibilities to enforce the Indiana Hemp Law and provide this information to the public through this report.

Prepared and Submitted By:  
Don Robison



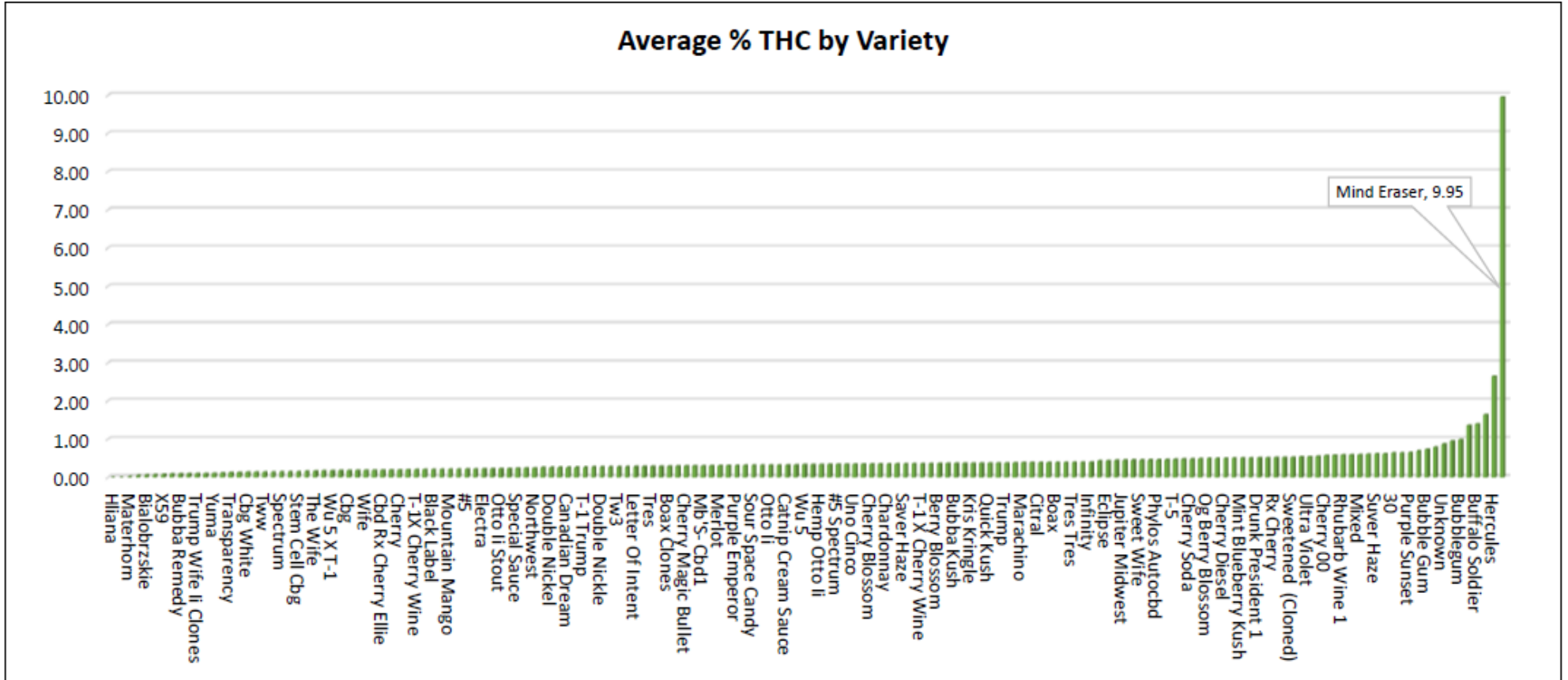
Seed Administrator

Marguerite Bolt

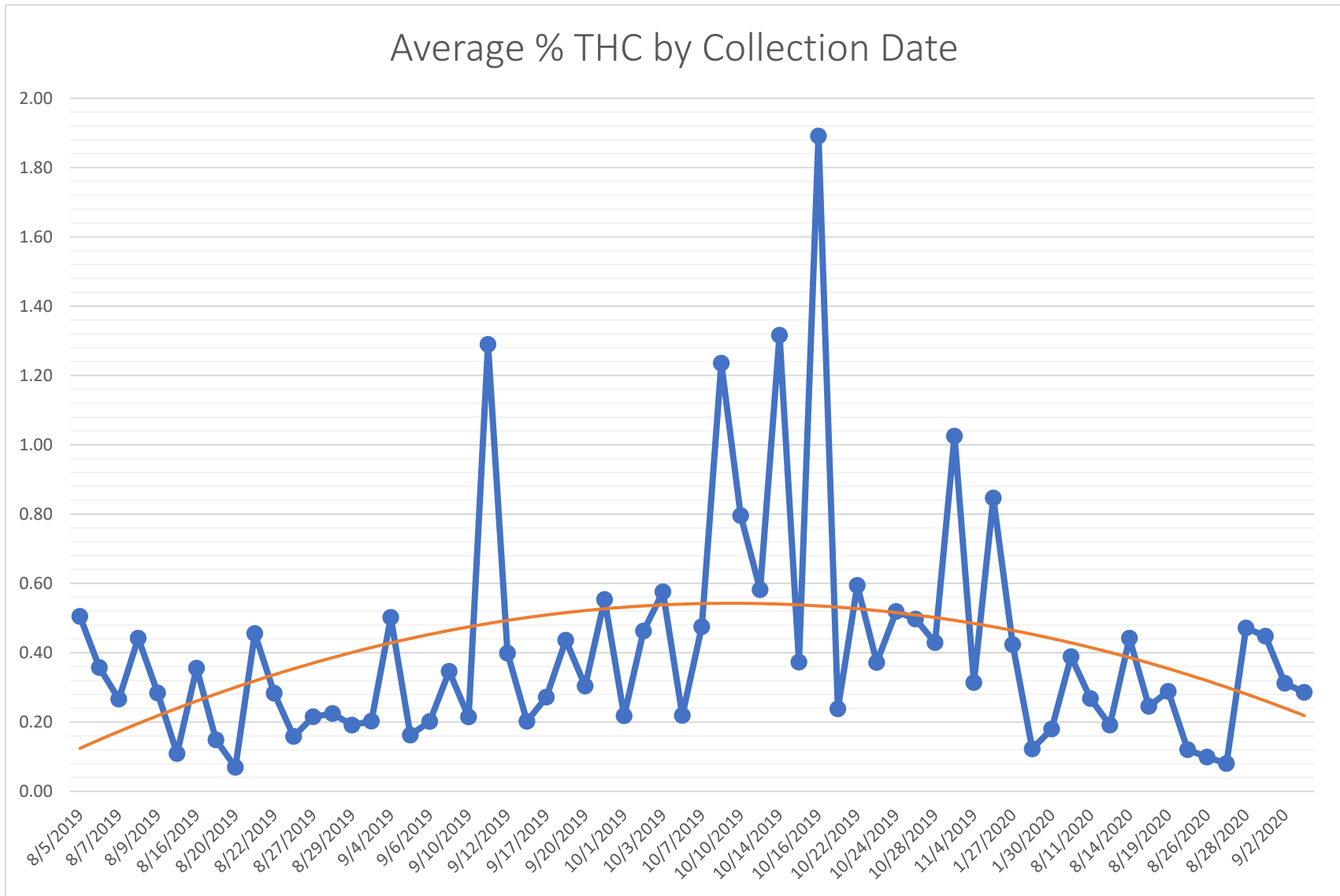


Purdue Hemp Extension Specialist

### Average THC by Variety Chart



### Average THC by Date



## Average THC by Variety Table

Variety	Average of THC
Hliana	0.00
Janet'S G	0.00
Materhorn	0.02
X-59	0.04
Bialobrzskie	0.05
A2	0.06
X59	0.07
Matterhorn	0.08
Bubba Remedy	0.08
2	0.08
Trump Wife li Clones	0.09
Sour G	0.09
Yuma	0.09
Trump Wife 1	0.10
Transparency	0.12
Cinco	0.12
Cbg White	0.13
Double Nickle Clone	0.13
Tww	0.13
Matterhorn Cbg	0.13
Spectrum	0.14
Tygra	0.14
Stem Cell Cbg	0.14
Uno X Cinco	0.16
The Wife	0.16
Klr1	0.17
Wu 5 X T-1	0.17
Treasure	0.18
Cbg	0.18
Atypical Canadian Dream	0.18
Wife	0.18
Cucumber Diesel	0.18
Cbd Rx Cherry Ellie	0.18
Purple Melon	0.19
Cherry	0.19
Bubba Cush	0.20
T-1X Cherry Wine	0.20
Midwestern	0.21
Black Label	0.21

Tw1	0.21
Mountain Mango	0.21
Buddhas	0.21
#5	0.22
Cherry Bounce	0.22
Electra	0.22
White Cbg	0.23
Otto li Stout	0.23
Afternoon Delight	0.23
Special Sauce	0.24
T-1Xcherry Wine	0.24
Northwest	0.24
Cherry Diesel X Wu 5	0.25
Double Nickel	0.25
Goliath	0.26
Canadian Dream	0.26
Cherry Bomb	0.26
T-1 Trump	0.26
Superwoman	0.27
Double Nickle	0.27
Wu5	0.27
Tw3	0.27
Not Known	0.27
Letter Of Intent	0.27
Dream Tonic #5	0.27
Tres	0.28
Napalese Tonic	0.28
Boax Clones	0.28
Compliance	0.28
Cherry Magic Bullet	0.29
Marlot	0.29
Mb'S- Cbd1	0.29
Hybrid #9	0.29
Merlot	0.30
Midwest	0.30
Purple Emperor	0.30
Berry Blossim	0.31
Sour Space Candy	0.31
Berry Blossoms	0.31
Otto li	0.31
Cherry Diesel/Wu	0.31

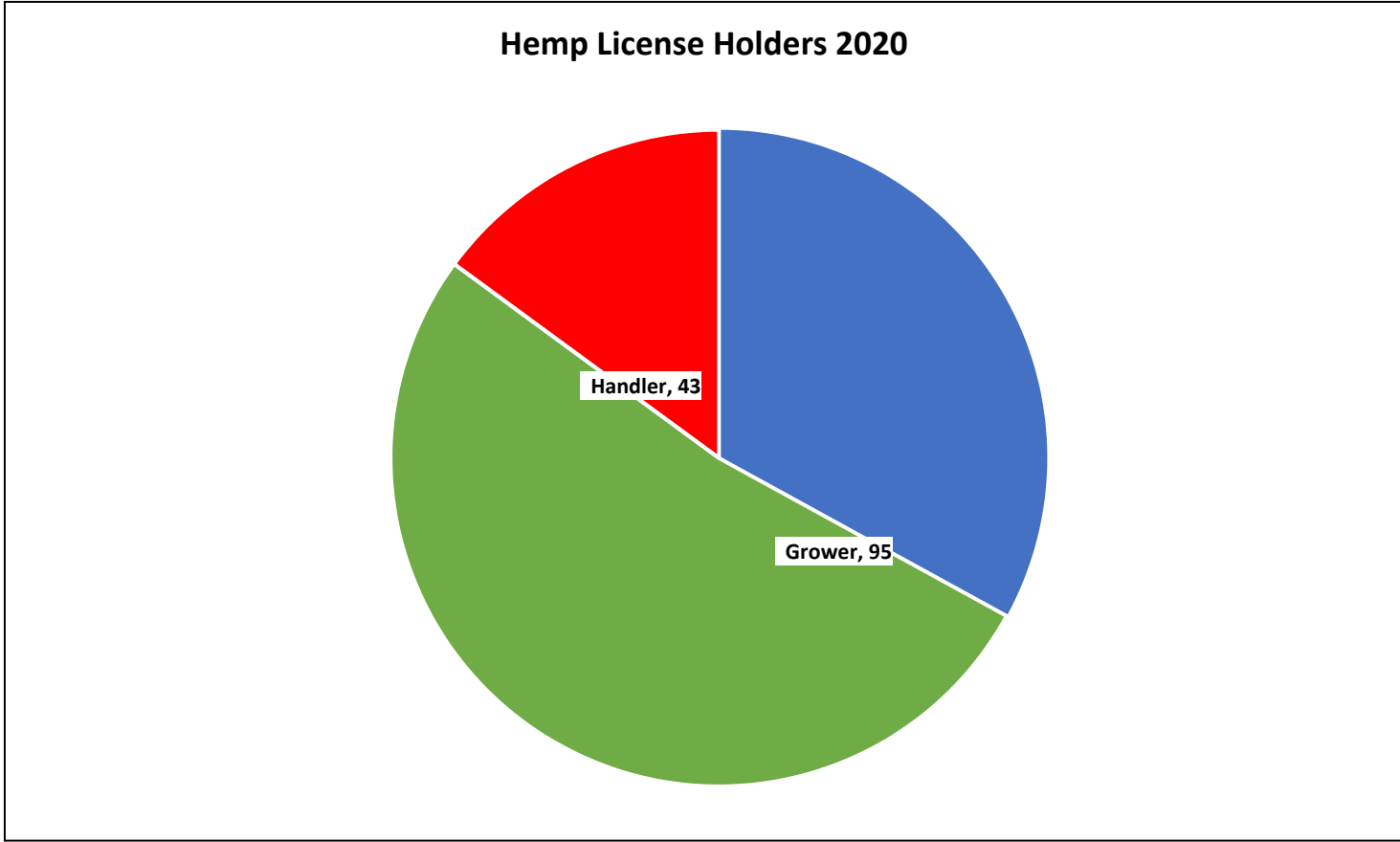
<b>Catnip Cream Sauce</b>	0.31
<b>Cbdr X Cherry</b>	0.32
<b>Wu 5</b>	0.32
<b>Awesome Blossom</b>	0.33
<b>Hemp Otto li</b>	0.33
<b>Abacus</b>	0.33
<b>#5 Spectrum</b>	0.33
<b>Tww2</b>	0.33
<b>Uno Cinco</b>	0.34
<b>T-1</b>	0.34
<b>Cherry Blossom</b>	0.34
<b>Auto Pilot</b>	0.34
<b>Chardonnay</b>	0.34
<b>Autoflower</b>	0.35
<b>Saver Haze</b>	0.35
<b>Z-Lights</b>	0.35
<b>T-1 X Cherry Wine</b>	0.35
<b>R X Cherry</b>	0.35
<b>Berry Blossom</b>	0.36
<b>D2T-1</b>	0.36
<b>Bubba Kush</b>	0.36
<b>Space Force</b>	0.36
<b>Kris Kringle</b>	0.36
<b>Scarlet</b>	0.37
<b>Quick Kush</b>	0.37
<b>Proof Of Life</b>	0.37
<b>Trump</b>	0.37
<b>Dear Abby</b>	0.37
<b>Marachino</b>	0.39
<b>Berry Blossum</b>	0.39
<b>Citral</b>	0.39
<b>Cherry Butter</b>	0.39
<b>Boax</b>	0.39
<b>Drunk President 7</b>	0.39
<b>Tres Tres</b>	0.39
<b>Lifter</b>	0.39
<b>Infinity</b>	0.39
<b>Fixer</b>	0.43
<b>Eclipse</b>	0.43
<b>Sr-1</b>	0.44
<b>Jupiter Midwest</b>	0.44



<b>Boax Ellie</b>	0.44
<b>Sweet Wife</b>	0.44
<b>Sunstrand</b>	0.45
<b>Phylos Autocbd</b>	0.45
<b>Trophy Wife</b>	0.45
<b>T-5</b>	0.46
<b>Early Bird</b>	0.47
<b>Cherry Soda</b>	0.47
<b>Maverick</b>	0.48
<b>Og Berry Blossom</b>	0.49
<b>Hawaiian Haze</b>	0.49
<b>Cherry Diesel</b>	0.49
<b>Hot Blonde</b>	0.49
<b>Mint Blueberry Kush</b>	0.50
<b>Cherry Abacus</b>	0.50
<b>Drunk President 1</b>	0.50
<b>Cherry Blossom</b>	0.50
<b>Rx Cherry</b>	0.51
<b>Sr1</b>	0.51
<b>Sweetened (Cloned)</b>	0.51
<b>Jupiter Midwest Strain</b>	0.53
<b>Ultra Violet</b>	0.53
<b>Magic Bullet</b>	0.54
<b>Cherry 00</b>	0.56
<b>Grape Soda</b>	0.57
<b>Rhubarb Wine 1</b>	0.58
<b>Cherry Wine</b>	0.59
<b>Mixed</b>	0.59
<b>Bubba Kush Cbd</b>	0.60
<b>Suver Haze</b>	0.61
<b>Jin Ma</b>	0.62
<b>30</b>	0.64
<b>Sweetened</b>	0.64
<b>Purple Sunset</b>	0.65
<b>Jen Ma</b>	0.68
<b>Bubble Gum</b>	0.72
<b>Perma Hill</b>	0.78
<b>Unknown</b>	0.86
<b>Trump 1</b>	0.94
<b>Bubblegum</b>	0.98
<b>Abacus X Cherry Wine</b>	1.35

<b>Buffalo Soldier</b>	1.39
<b>Remedy</b>	1.63
<b>Hercules</b>	2.63
<b>Mind Eraser</b>	9.95

# Type of License Holder



## Hemp Production Survey (Marguerite Bolt)

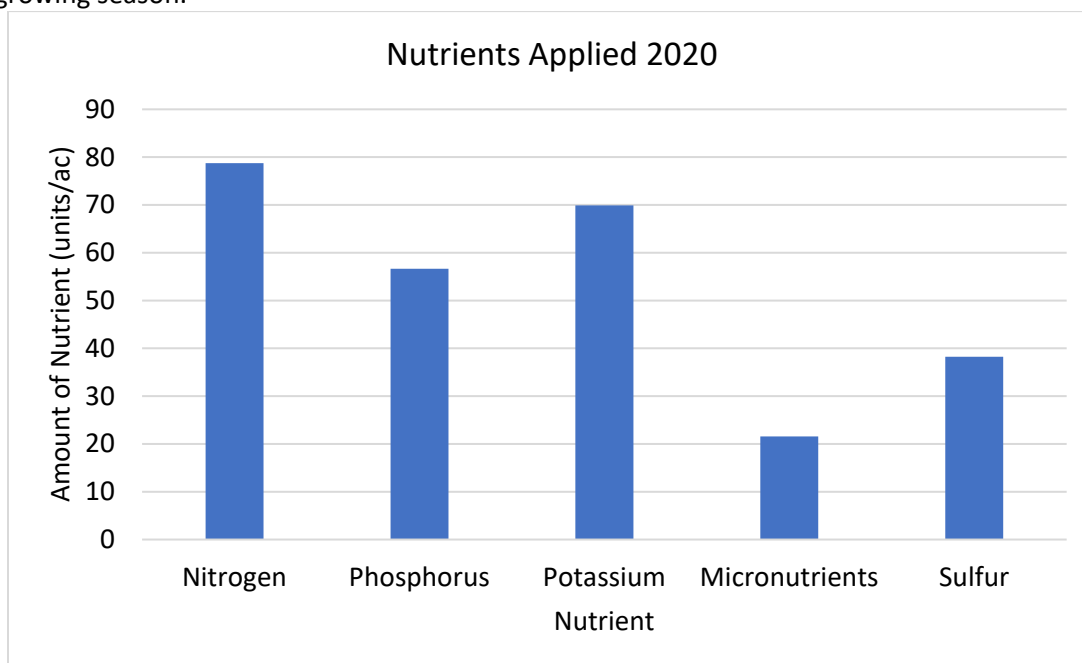
Surveys were distributed to all license holders. There were 443 surveys submitted through Qualtrics to OISC.

### Planting information

There were 8,951 acres registered in 2020, however, due to several reasons, only 2307.055 acres were planted and only 1173.13 acres were harvested. There were 1.76 million square feet of indoor space registered in 2020. There were 346,684.00 square feet planted indoors and 322,234 square feet harvested indoors. One major reason for the difference in registered acres and harvested acres in 2020 could be due to the uncertainty surrounding the COVID-19 pandemic which has led to serious economic uncertainty among farmers, processors and retail outlets.

### Nutrient Inputs

Growers reported the application of Nitrogen, Phosphorus, Potassium, Sulfur and micronutrients for the 2020 growing season.

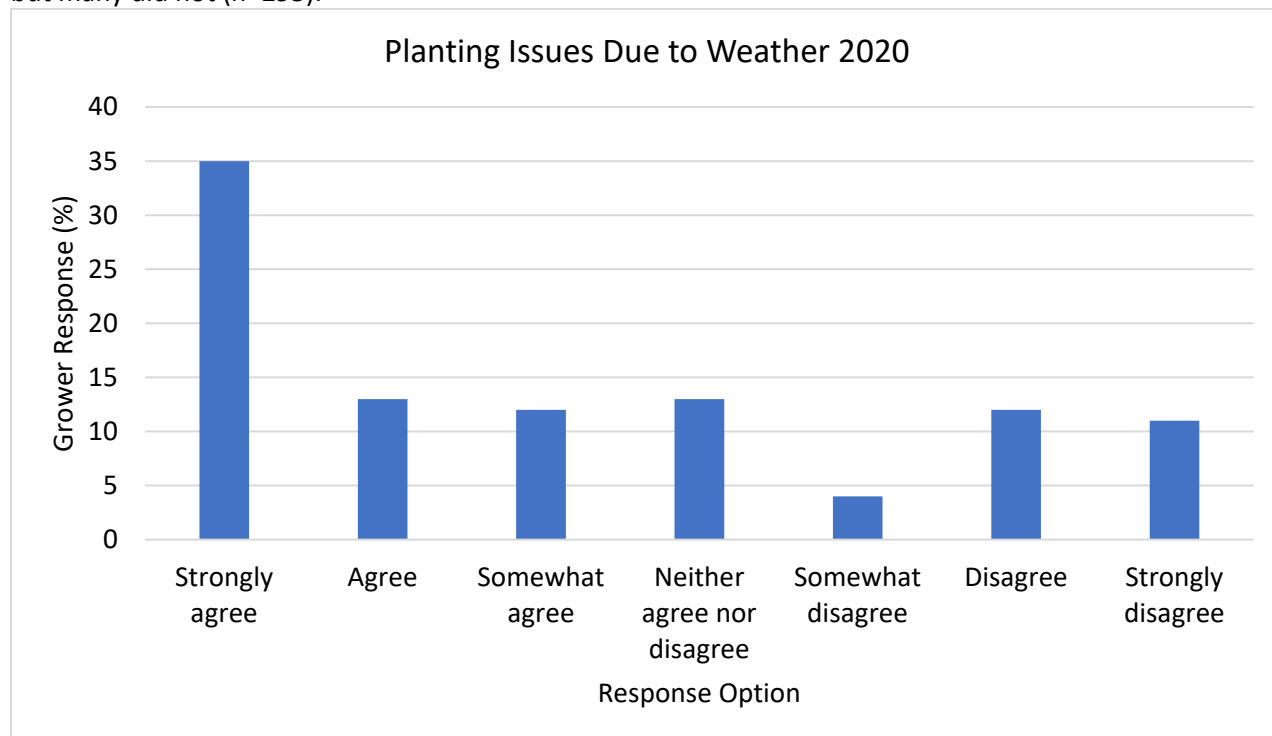


### Irrigation

Growers were asked about irrigation. Most of the respondents use some form of irrigation (64% of respondents) (n=120). Of the growers that irrigate, 49% of them use drip tape irrigation. The remaining 15% use overhead irrigation. Because the majority of hemp grown in the state is for cannabinoids, it is not surprising to see drip irrigation more commonly used since most cannabinoid hemp is produced with wide row spacing like a horticultural crop.

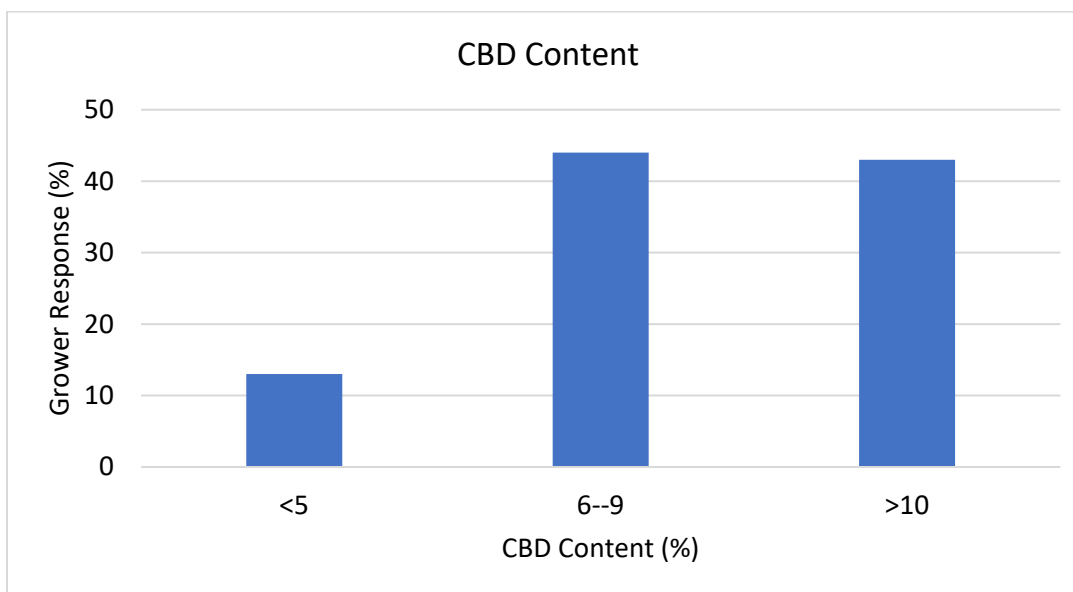
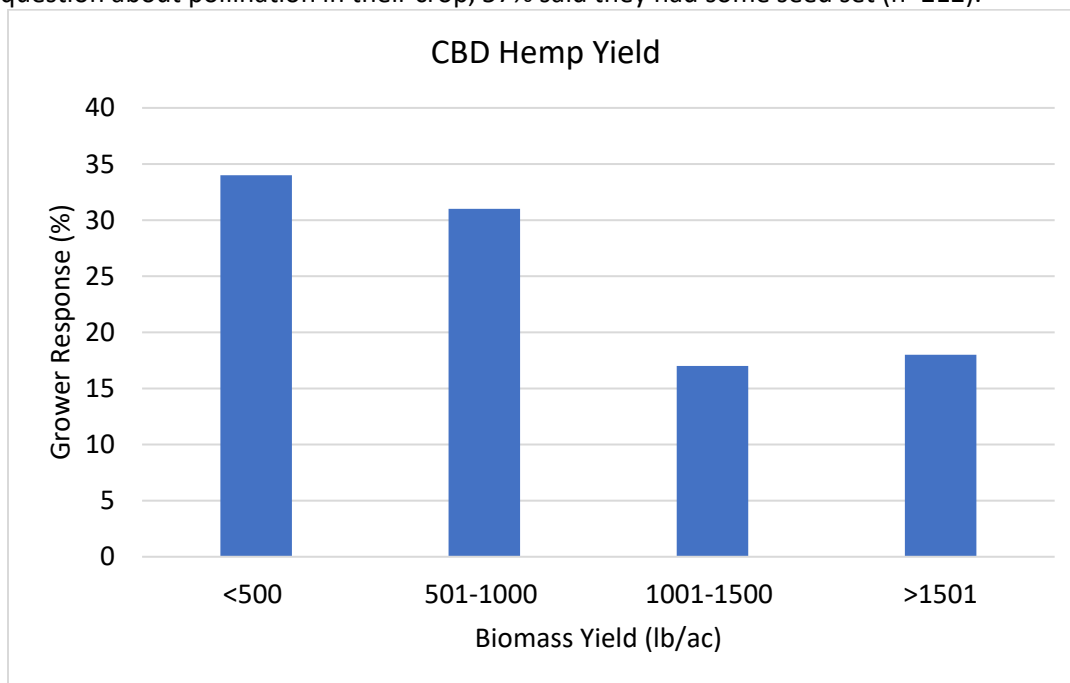
## Weather

Growers were asked about planting issues due to weather. 2019 was one of the wettest summers on record for Indiana, which caused delayed plantings. In 2019 the majority of growers had difficulties planting their hemp due to weather. In 2020 some growers did have difficulties planting due to weather, but many did not (n=295).

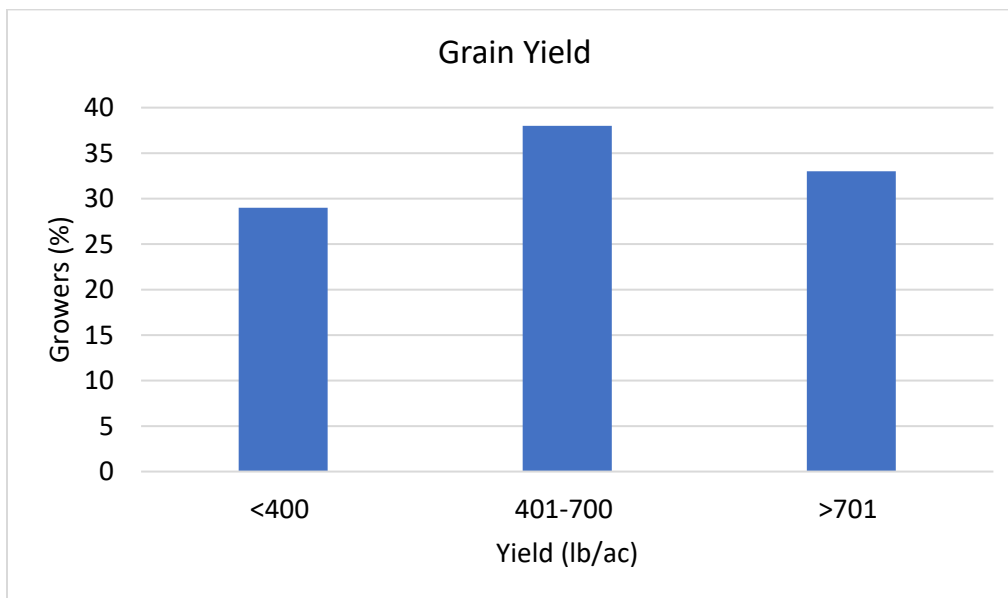


## Yields

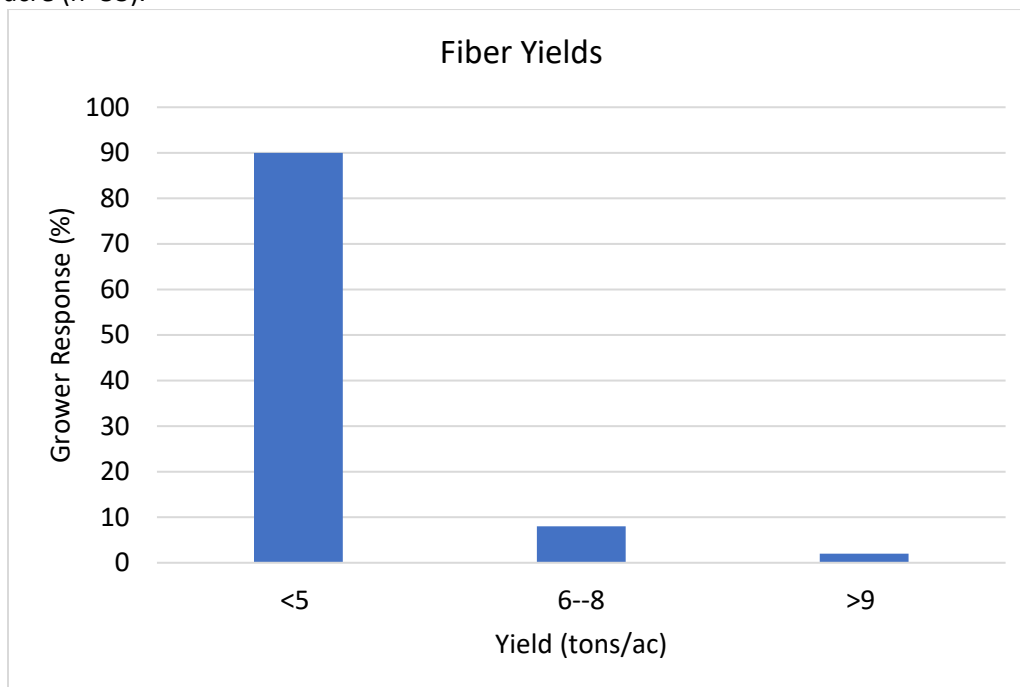
Growers were asked about yields pertaining to the specific type of hemp produced. Cannabinoid yields were measured as biomass yield per acre and average CBD content. The majority of growers that responded produced less than 500 pounds of biomass per acre or between 501 and 1000 pounds per acre (n=170) and had CBD yields from 6 to over 10 percent (n=185). Of the CBD growers that responded to the question about pollination in their crop, 57% said they had some seed set (n=212).



Grain yields were recorded as pounds of seeds per acre. More growers harvested between 401 and 700 pounds per acre compared with the other two yield categories (n=24).



Fiber yields were recorded as pounds of biomass per acre. The majority of growers produced less than 5 tons per acre (n=53).



## Insects

Insects and mites are found in outdoor and indoor hemp environments. We see pests, natural enemies, and pollinators in production for fiber, seed and cannabinoids. The results covered in this section will focus on pests, natural enemies and pollinators.

Growers were asked to identify insect and mite pests found on different parts of their hemp plants including flowers/seed heads, leaves, stems and roots. Known pests of hemp were included and growers could select more than one option. Not every licensee answered the insect and mite related questions. There were 443 total surveys collected, but we did not see any of the insect and mite questions get responses from all 443 respondents. This could be explained by the type of production (indoor growers will likely not observe corn earworm or Eurasian hemp borer) or because the license holder was a processor/handler or research advisor. Some growers may not have scouted during the field season or if they did, they did not observe the specific insects and mites provided in the survey. This survey data will help us understand the pertinent pests and beneficial organisms observed in 2020 and prepare us for what could expect in 2021.

### Flower/Seed Head Pests

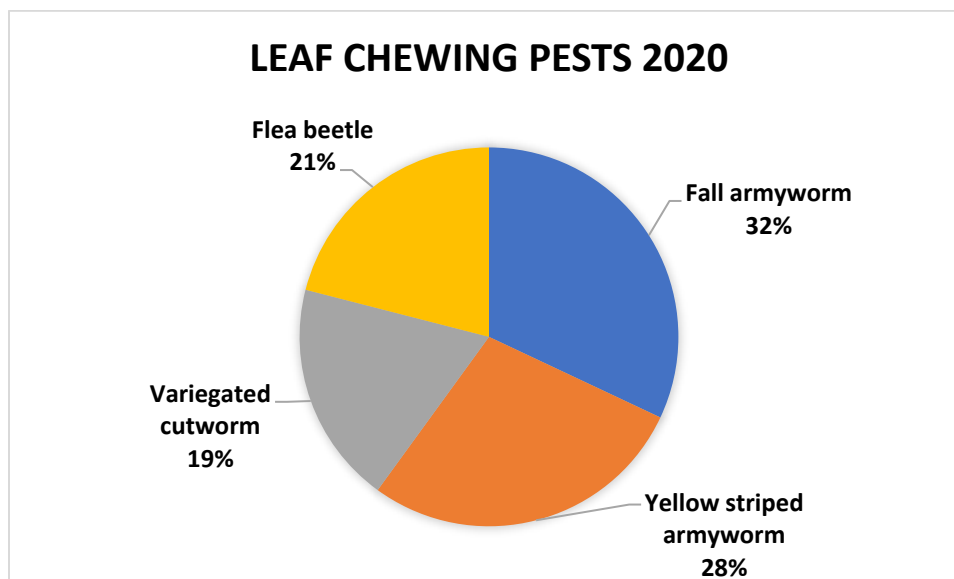
There are two particularly damaging flower feeding pests found in Indiana on hemp, corn earworm (*Helicoverpa zea*) and Eurasian hemp borer (*Grapholita delienseana*). There were 134 respondents that observed one or both of these flower chewing insects, resulting in 147 responses. The most commonly observed pest found in flowers (for cannabinoid production) and seed heads (for grain/seed production) was the corn earworm, representing 84% of the observations (n=147). There has been considerable effort to get insecticides labeled for hemp; we have several biopesticides (fungi, viruses, bacteria) available for corn earworm management in 2021 for Indiana hemp producers. Please visit the [pesticide section](#) to view these products.

A smaller percentage of respondents observed Eurasian hemp borer, making up 16% of the observations (n=147) in outdoor hemp production. This insect can be considered both a stem and flower pest. It appears that Eurasian hemp borer tunnels into small branches until female plants begin to flower. During the reproductive stage of hemp, larvae can be found boring into the base of flowers where they feed from the inside out, causing direct. Because of this stalk and flower feeding behavior, you will also see Eurasian hemp borer included in the stalk boring pest section.

### Leaf Chewing Pests

The most commonly observed leaf chewing pests were predominately moth larvae frequently found in the Indiana landscape. There were 128 respondents that observed one or more of the leaf chewing pests listed below, resulting in 176 responses. 32% of the observed leaf chewing pests were fall armyworm (*Spodoptera frugiperda*), 28% were yellow striped armyworm (*Spodoptera ornithogalli*), and 19% were variegated cutworm (*Peridroma saucia*) (n=176). In addition to these three lepidopteran species, 21% of leaf chewers observed were flea beetles (n=176). We have noticed that leaf damage is most apparent mid- to late-season when plants are large and have abundant foliage, but growers should scout early and often for pests to ensure there are not early season defoliators causing damage to smaller plants.





### Stalk Boring Pests

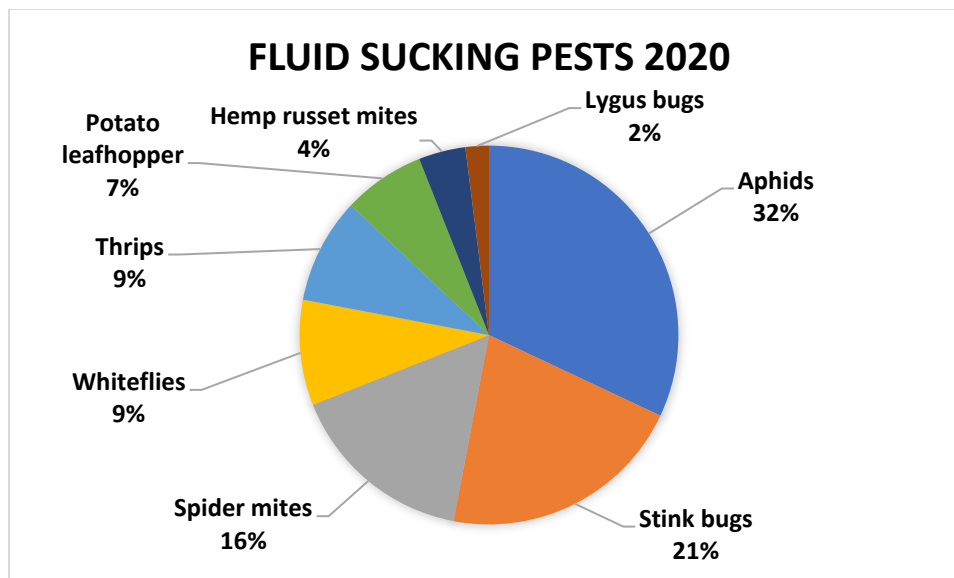
There are two primary stalk boring pests found in Indiana hemp at this point, European corn borer (*Ostrinia nubilalis*) and Eurasian hemp borer (*Grapholita delineaana*). Common stalk borer (*Papaipema nebris*) was observed on one farm in Indiana and seems uncommon in hemp at this point, this could change. There were 44 respondents that observed one or both of the primary stalk boring insects found in Indiana, resulting in 52 responses. The most commonly observed borer was the European corn borer, representing 79% of the observations, while Eurasian hemp borers represented 21% of observations (n=52).

### Root Feeding Pests

We asked growers if they observed any root feeding insects. 87% of respondents said no, they did not observe such pests, while 13% said they did observe root feeding insects, such as fungus gnats (n=250).

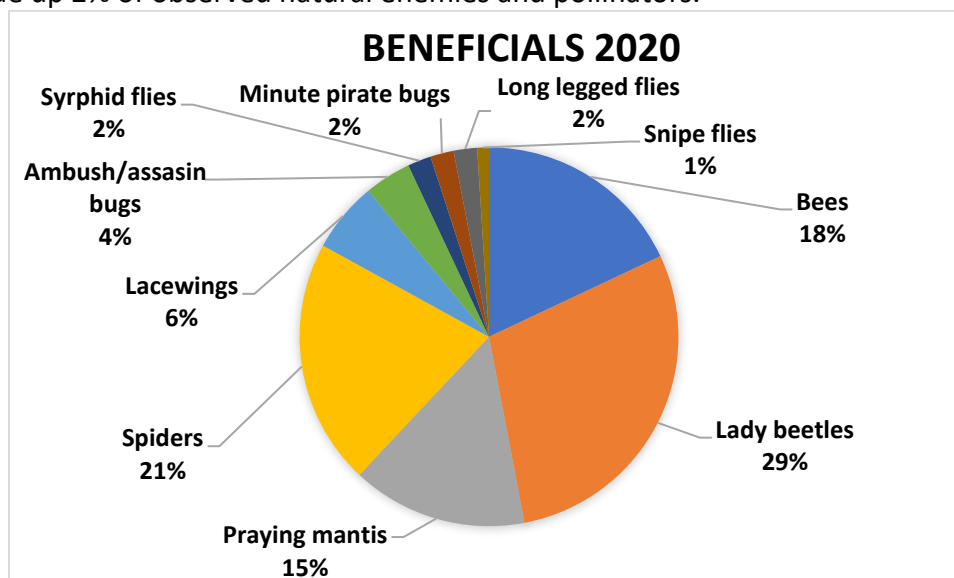
### Fluid Sucking Pests

We asked growers to identify the fluid sucking pests they observed on hemp. There were 171 respondents that observed one or more of the fluid sucking pests listed below, resulting in 342 responses. The most commonly observed pests that suck fluid from hemp plants were aphids (32%), followed by stink bugs (21%), and spider mites (*Tetranychus urticae*) (16%) (n=342). Other observed pests included thrips (9%), whiteflies (9%), potato leafhopper (*Empoasca fabae*) (7%), hemp russet mites (*Aculops cannibicola*) (4%), and lygus bugs (2%).



#### Natural Enemies and Pollinators

We asked growers to identify the natural enemies and pollinators they observed in hemp fields. There were 219 respondents that observed one or more of the natural enemies and pollinators listed below, resulting in 640 responses. The most commonly observed predators included ladybird beetles (29%), spiders (21%), and praying mantids (15%) (n=640). Respondents observed, to a lesser extent, lacewings (6%), ambush/assassin bugs (4%), minute pirate bugs (2%), long legged flies (2%), and snipe flies (1%). 18% of observed beneficial organisms were bees, but we did not differentiate between species of bee. Another beneficial insect that serves as a pollinator in its adult stage but as a predator in its larval stage are syrphid or hover flies, which made up 2% of observed natural enemies and pollinators.

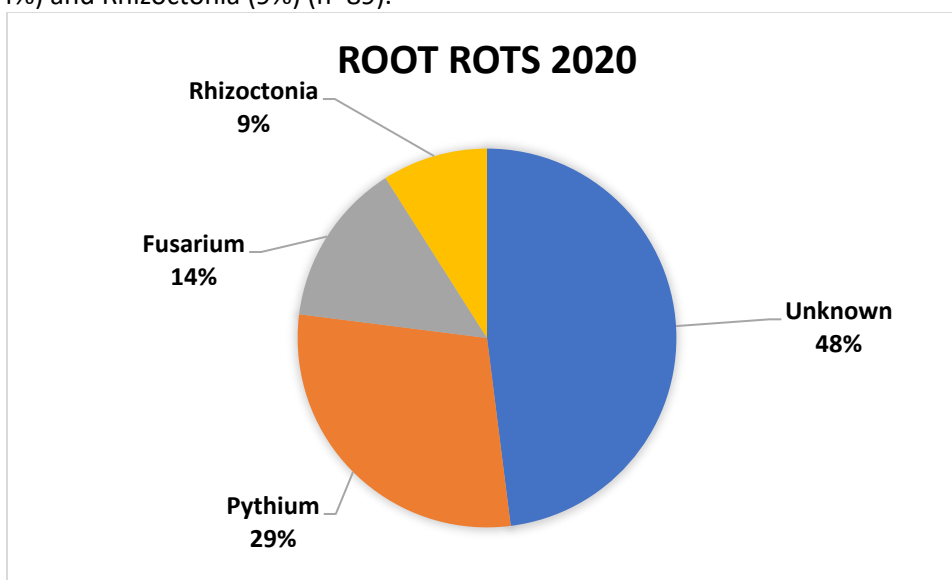


## Diseases

Hemp is susceptible to many different diseases. Growers were asked about pathogens that attack different parts of the hemp plant. Some of the diseases are more prevalent in the beginning of the season, like damping off diseases, some of the crown diseases are more prevalent towards the end of the season, like bud rot.

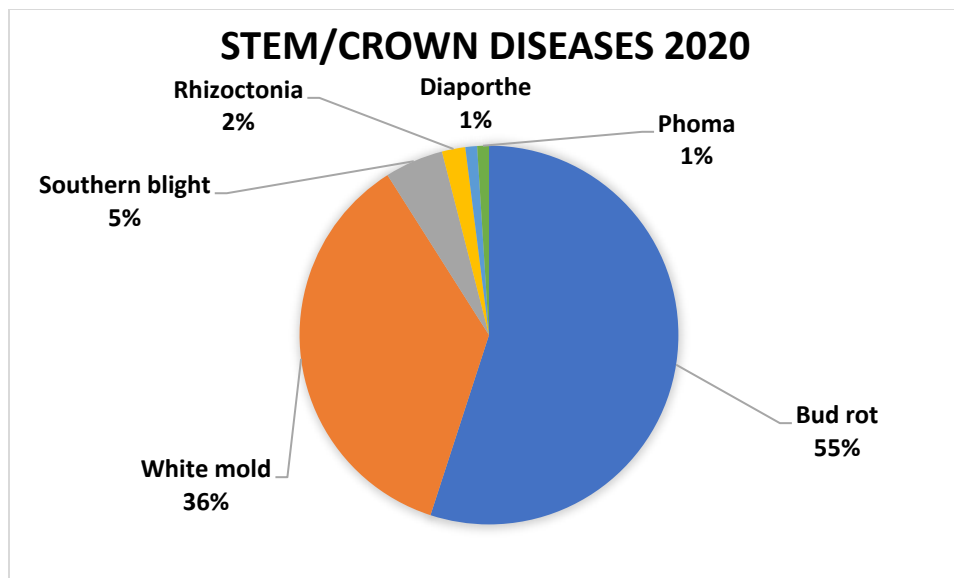
### Damping Off Diseases and Root Rots

We asked growers whether they saw damping off diseases/root rots in their hemp. There were 71 respondents, resulting in 89 total responses. 48% of respondents that observed damping off did not know the causal agent. Pythium made up 29% of the observed damping off/rot diseases, followed by fusarium (14%) and Rhizoctonia (9%) (n=89).



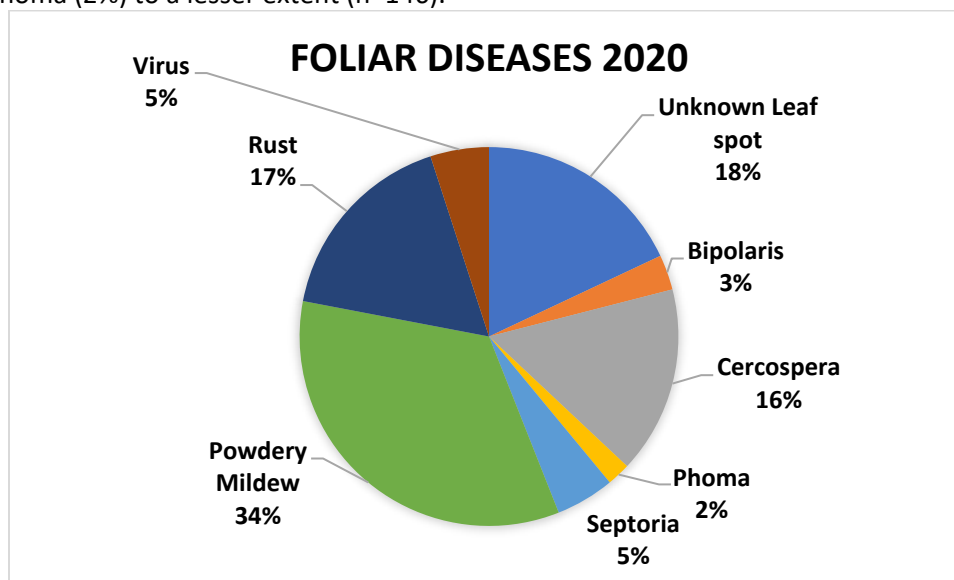
### Stem/Crown Diseases

We asked grower if they saw any stem and crown diseases in their hemp. There were 95 respondents, resulting in 121 total responses. Bud rot or bud blast was the most common stem/crown disease observed (55%), followed by white mold (36%), southern blight (5%), Rhizoctonia (2%), Diaporthe (1%) and Phoma (1%) (n=121)



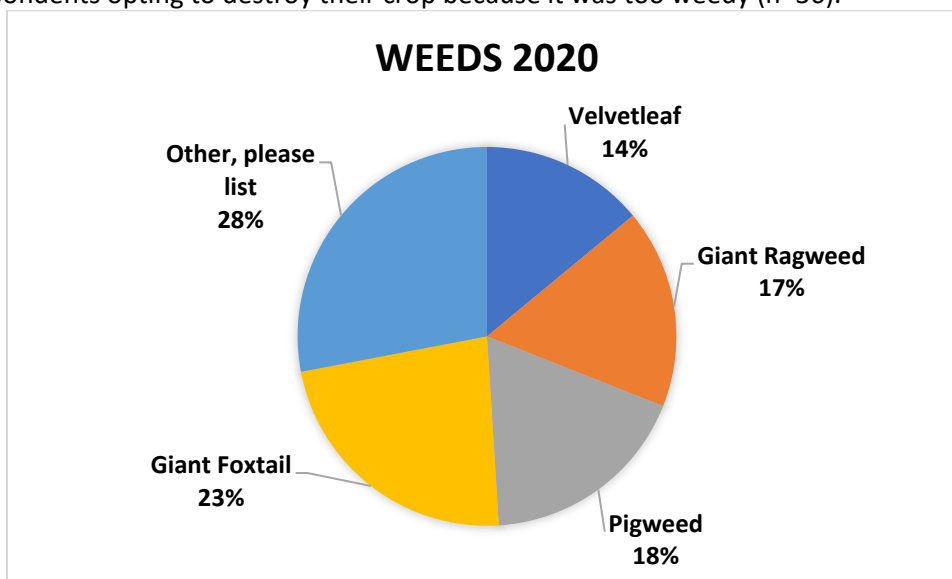
#### Foliar Diseases

We asked growers if they saw any foliar diseases in their hemp. There were 116 respondents, some growers observed more than one foliar disease, resulting in 146 total responses. Powdery mildew was the most common foliar disease observed (34%), followed by unidentified or unknown leaf spots (18%), rust (17%) and Cercospora (16%) (n=146). Growers also observed Septoria (5%), viruses (5%), Bipolaris (3%), and Phoma (2%) to a lesser extent (n=146).



## Weeds

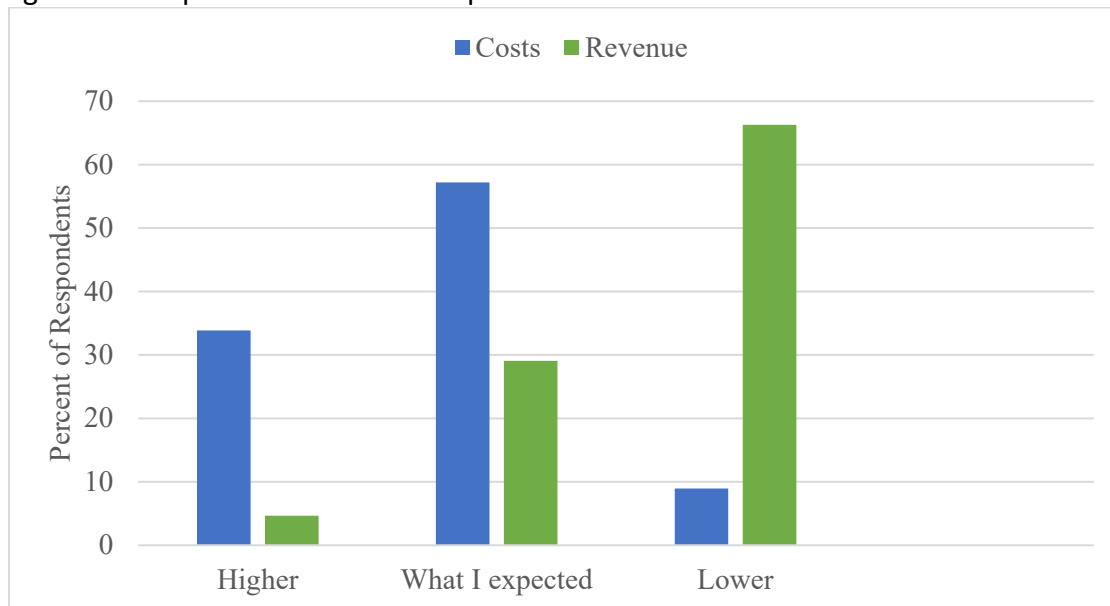
Weed pressure is common in hemp with the limitation of established management practices and no conventional herbicides labeled for use in the crop. Growers were asked about weeds seen in their hemp fields. There were 225 respondents, resulting in 406 total responses. Commonly observed weeds in hemp fields included giant foxtail (23%), pigweed (18%), giant ragweed (17%), and velvetleaf (14%). Many growers observed other weeds (28%). This included grasses, marestalk, Johnson grass, lamb's quarters, morning glory, and Canadian thistle. Weeds were an issue when it came to harvesting, with 11% of respondents opting to destroy their crop because it was too weedy (n=36).



## Economics (Dr. Maria Marshall)

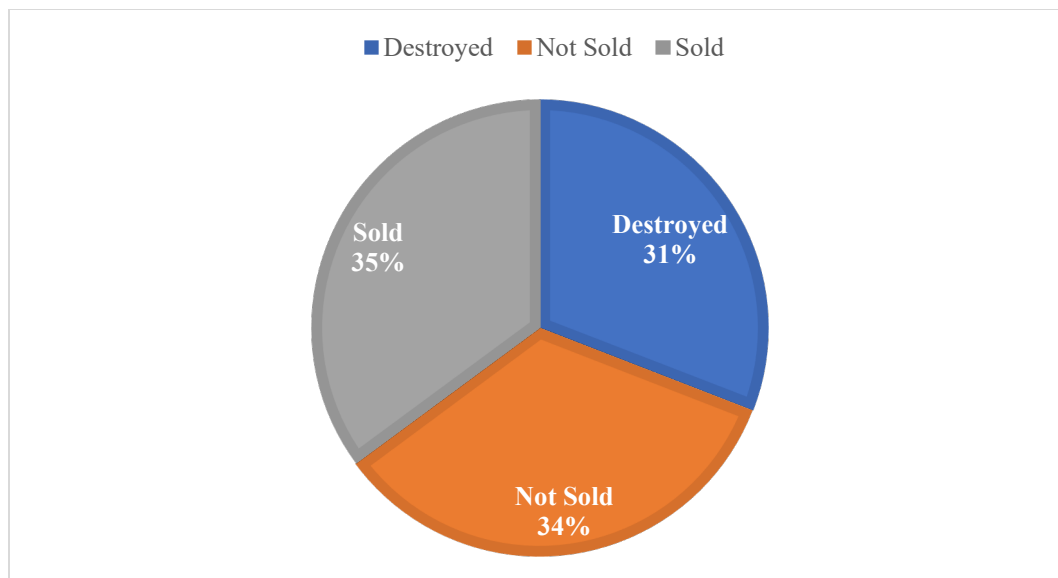
Revenue was higher for only 5% of respondents and 66% of responded that their revenue was lower than they expected (figure 1). The opposite was true for expected costs. The majority (57%) stated that costs were as expected and 34% stated that costs were higher than expected. Just as in the 2019 growing season, hemp licensees had a good handle on costs, but they overestimated the revenue they could achieve.

Figure 1. Hemp cost and revenue expectations



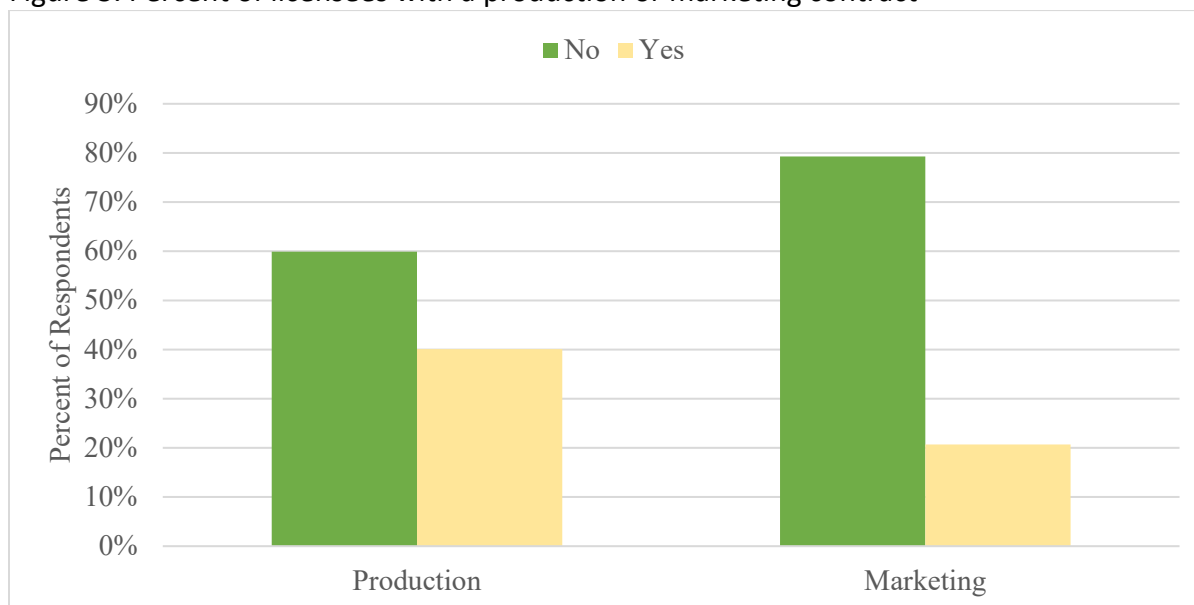
Respondents were asked what happened to their crop this season (figure 2). The distribution was pretty even with 35% stating that it had been sold to a processor, 34% stating that they were still waiting to sell to a processor, and 31% stating that it had been destroyed.

Figure 2. Percent of licensees that sold, destroyed, or are in waiting to sell their product



Hemp licensees seem to have an aversion to both production and marketing contracts. In 2019, 21% of respondents stated that they were not at all likely to enter into a production contract in 2020 and 29% of respondents stated they were not at all likely to enter into a marketing contract in 2020. Yet, the numbers are much higher as shown in figure 3. Sixty percent had no production contract compared to 56% in 2019 and 79% (compared to 75% in 2019) had no marketing contract. This may be correlated with 34% of respondents still looking for a processor. This year the numbers are similar for next season in terms of those not likely to enter into production (25%) or marketing (31%) contracts.

Figure 3. Percent of licensees with a production or marketing contract



Hemp licensees continue to perceive the hemp market has risky as shown in figure 4. In 2019, 65% of respondents indicated that they perceived the hemp market to be very or extremely risky. This year that number increased to 68% that considered the market to be very or extremely risky.

Figure 4. Licensees' perceptions of risk in the hemp market

