

Crop Science Test: Competency Areas

Pesticides

- understand how to read a pesticide label
- understand how pesticides can reach off target areas
- understand how to apply pesticides and clean pesticide sprayers

Insects and nematodes

- know all insects have six legs
- know beneficial insects in crop production and why these insects are beneficial
- know key insects pests of Michigan including soybean aphid, corn rootworm, corn borer, potato leaf hopper, alfalfa weevil, black cutworm, and Colorado potato beetle.
- know soybean cyst nematode, sugar beet cyst nematode, and corn needle nematode
- know how to manage these key insect and nematode pests

Plant diseases

- know the disease triangle (pathogen, host, and environment)
- know key plant diseases in Michigan including white mold of soybeans or dry beans, grey leaf spot in corn, stalk rot in corn, wheat rust, and *Fusarium* head blight (scab) in wheat, Hessian fly.
- know how to manage these key plant diseases
- why are seeds of many crop species treated with fungicide before planting

Weeds

- know how weeds compete in crops for moisture, nutrients, and light
- explain how weeds reduce crop yield and crop quality
- water is the most limiting factor in crop production in MI and weeds need water

Integrated Pest Management (IPM)

- what does IPM stand for? What does IPM mean?

Liming

- why lime; how lime; what does lime do to soil pH, acidic soil pH, basic soil pH
- dolomitic lime; when is this type of lime used
- what pH is preferred by most field crops. why.

Nitrogen

- know the nitrogen cycle
- know why nitrogen should not be applied in the fall
- examples of nitrogen fertilizer and the % nitrogen (anhydrous ammonia 82%)
- sources of nitrogen include commercial fertilizer, manure, cover crops, SOM
- hazards of nitrogen in drinking water
- why nitrogen can leach and reach groundwater
- why plants use nitrogen

Phosphorus

- phosphorus does not have a tendency to leach
- phosphorus movement in soil is limited
- phosphorus fertilizer names and analyses

Potassium (K)

- why is potassium applied. Potassium chloride, potash 60% K
- potential of potassium to runoff or leach

Macro and micro nutrients

- macronutrients are N, P, K, Mg, Ca, and S
- micronutrients include Zn, Mn, Fe, Cu, B, Mb
- why are some nutrients called macronutrients and some micronutrients?
- why is fertilizer applied to soil? Aren't these nutrients already in the soil?

Corn, Soybeans, Wheat, Edible Beans, Alfalfa

- planting date, seeding rate, seeding depth, row spacing, plant population, fertilizer program, weed control program (pre, post, both, when herbicides are applied, when is the crop cultivated), when crops flower, how to tell the crop is mature, % moisture at harvest, harvesting dates
- the advantage of planting corn or soybeans in narrow rows.
- seeding depth issues with a soybean drill
- what is soybean inoculant
- how soil type influences planting depth
- how geography influences planting date
- why the flag leaf in wheat is important
- navy beans, black beans, kidney beans. Which seed is bigger? Which seed would be planted at a higher rate in terms of seeds/acre? in terms of pounds of seed/acre?
- % of U.S. corn acres that are Roundup Ready
- % of U.S. soybean acres that are Roundup Ready
- % of U.S. corn acres that have the Bt trait (corn borer or rootworm)
- which crops are self-pollinated and which crops are cross pollinated
- classes of wheat grown in Michigan
- most important factors in choosing what variety to plant (for all crops listed)

Photosynthesis/Respiration/Transpiration

- equation for photosynthesis
- what happens to the oxygen produced in photosynthesis
- equation for respiration
- where does photosynthesis occur. When does photosynthesis occur
- when does respiration occur
- identify leaf stomata, guard cells, mesophyll cells, leaf cuticle, leaf veins (vascular bundles)
- what is transpiration and why does it occur

Plant Taxonomy

- what is a culm, stalk, tuber, rhizome
- what is the male floral structure on corn; what is the female structure on corn
- name the male floral parts (anther, filament) and the female floral parts (stigma, style, and ovary)
- what are the parts of the seed (seed coat, embryo, and endosperm (or cotyledons)).
- What is the importance of each of these structures?

Crop Rotation

- number one benefit of crop rotation
- reasons why crop yield is increased when crops are rotated
- at what times can rye be seeded in a crop rotation? at what times red clover?

Soil Organic Matter and Soil

- what is a common % in the state of MI
- how can growers increase the % SOM
- why would growers want to increase SOM (more nutrient holding capacity, better water infiltration, less crusting, etc.)
- what % of an ideal soil is pore space? What % of the pore space should be filled with water for plant production?
- clay, silt, sand. Which soil particle is the smallest? the largest?

Living Soil

- name macro and microorganisms that live in the soil
- what are actinomycetes and why are they important in the soil
- how does crop plant residue 'break down' in the soil
- why are earthworms important
- why are Rhizobacteria important to soybeans and alfalfa

Soil Sampling

- how often should soil be sampled
- what is the difference between grid and zone sampling
- how deep should soil samples be taken

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