ARIZONA

Certified Crop Adviser

Performance Objectives

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NUTRIENT MANAGEMENT

1. Cation exchange capacity (CEC).
    - Relationship to plant nutrition and mobility of plant nutrients in the soil
    - Soil properties that affect the CEC of soils
2. Soil pH.
    - Effect on availability of plant nutrients
    - Effect of fertilizer materials on soil pH
    - Recommended ranges for crop production
3. Acidifying soils.
    - Acidifying materials
    - Sulfur rates to change
4. The mineralization process and nutrients involved in that process.
    - Nitrogen
    - Sulfur
    - Zinc
5. Nitrogen deficiency symptoms.

Lettuce	Cole crops
Cotton	Potatoes
Melons	Tree Crops:
Alfalfa	Citrus
Potatoes	Pecans
Small grains	Apples

6. The Nitrogen cycle
    - Different forms of Nitrogen
    - Nitrification
    - Nitrogen loss pathways
        - Leaching
        - Denitrification
        - Volatilization
        - Mineralization
7. Available nitrogen from organic sources.
    - Legume
    - Manure
    - Bio-solids (sludges)
    - By-products/composts
8. Relationship between soil properties, rate of nitrogen fertilization, and nitrogen recovery by a crop.
9. Relationship between cropping systems and rate of nitrogen fertilization.
10. Role of phosphorus in plants.
    - Essential functions
    - Mobility

11. Phosphorus deficiency symptoms

Alfalfa	Potatoes
Cotton	Melons
Cole Crops	Tree Crops:
Lettuce	Citrus
Small grains	Pecans

12. Factors affecting phosphorus fertilization
    - Soil properties
    - Cropping system
    - Soil test level
13. Factors affecting soil retention and fixation of phosphorus
    - Soil pH
    - Soil texture
14. Role of potassium in plants.
    - Essential functions
    - Mobility
15. Potassium deficiency symptoms

Alfalfa	Potatoes
Cotton	Melon
Leafy Vegetables	Tree Vine:
Small grains	Citrus
Pecans	Apples

16. Factors affecting soil retention of potassium
    - Cation Exchange Capacity
    - Soil texture
17. Factors affecting potassium fertilization
    - Soil properties
    - Cropping system
18. Deficiencies of secondary and micronutrients

Magnesium	Fe
Sulfur	Mn
Zinc	Ca
Boron	Cu

19. Toxicities of secondary micronutrients
    a. Boron
    b. Sodium
    c. Chloride
    d. Urban pollutants
        - Carbon Monoxide
        - Ozone
20. Methods of correcting secondary and micronutrient deficiencies
    - Fertilization practices
    - Adjusting soil pH

21. Soil sampling and handling procedures
    - Time of sampling
    - Depth of sampling
    - Frequency of sampling (how often and how many)
22. Philosophies of soil testing
    - Buildup and maintenance
    - Efficiency use of nutrients
23. Interpretation of soil test results
    - Degree of nutrient deficiency or adequacy
    - Expected crop response to applied nutrients
24. Advantages and disadvantages of fertilizer applications
    - Water run versus side dress
    - Broadcast versus banded fertilizer
25. Nutrient movement in soil and water and the effects of soil, climate, and nutrient properties on movement.
    - Cation exchange capacity
    - Nutrient form -- cations and anions
    - Precipitation -- amount and distribution
    - Irrigation
26. Plant sampling and testing.
    - Determination of nutrient status
    - Plant part to sample
    - Use in troubleshooting
27. Fertilizer application
    - Calibrating dry/liquid
    - Calculate the amount fertilizer required to achieve fertilizer requirements
28. Know the difference between saline, sodic, and saline sodic soils
    - Types of different amendments
    - Types
        - Gypsum
        - Acids
        - Acid forming fertilizer
        - Acid polymer
29. Water quality
    a. SHR
    b. EC
    c. TDS
    d. pH
    e. Nutrient contents

SOIL AND WATER MANAGEMENT

1. Soil structure.
    - Effect on crop growth and production
    - Relationship to tillage and cropping system
    - Relationship to soil organisms
    - Relationship to soil drainage
2. Influence of tillage on erosion, soil structure, organic matter, compaction, and crop productivity.
3. Soil compaction and impermeable layers.
    - Methods to alleviate
    - Plant symptoms
    - Soil symptoms
4. Factors that influence the selection and use of tillage systems.
    - Environment
    - Soil properties
    - Management
    - Crop productivity
    - Crop rotation
5. Cover crops and green manure crops
    - Advantages and disadvantages
    - Species commonly used
    - Influence on soil organic matter
    - Influence on nutrient cycling and availability
6. Pump back systems (sumps)
7. Laser leveling (land leveling)

INTEGRATED PEST MANAGEMENT

1. Identification of the following weeds by common name at any growth stage and classification of each by life cycle:

barnyardgrass	bermudagrass	common lambsquarters
common purslane	field bindweed	field sandbur
horse purslane	Johnsongrass	junglerice
littleseed canarygrass	little mallow	London rocket
Mexican sprangletop	nettleleaf goosefoot	Palmer amaranth
prickly lettuce	prostrate knotweed	puncturevine
purple nutsedge	red sprangletop	Russian thistle
shepherdspurse	silverleaf nightshade	silversheath knotweed
southern sandbur	spiny sowthistle	sunflower
tumble pigweed	wild oat	morningglory
Wright groundcherry	yellow nutsedge	chara
common cattail	green algae	sago pondweed
tule		

2. Factors affecting weed/crop competition in cultivated crops.
    - Growth rate (crop and weed)
    - Germination and emergence
    - Seed dormancy
    - Vegetative reproduction
    - Shade tolerance
3. Noxious weeds and the noxious weed law.
4. Advantages and disadvantages of preplant incorporated, preemergence, and postemergence herbicide applications.
5. Soil, climatic, and antagonistic factors which affect the performance of preplant incorporated, preemergence, and postemergence applied herbicides.
6. Factor affecting the persistence of herbicide families
    - Soil moisture
    - UV exposure
    - Soil pH
    - Herbicide rate
    - Herbicide families
        - Triazines
        - Sulfonyl ureas
        - Phenoxys
        - Dinitroanalines
7. Use of cultural, chemical, biological, and mechanical weed control.
8. Advantages and disadvantages of cultural, chemical, biological, and mechanical weed control.
9. Relationship between herbicide mode of action and weed control.
10. Types, purposes, and advantages of herbicide adjuvants.
11. Classification of herbicides by mode of action.
12. Timing of herbicide applications.
13. Relationship between plant vigor, weed growth stage, and herbicide effectiveness and susceptibility to postemergence herbicides.
14. General plant symptoms caused by the following herbicide mode of action groups:

Root and shoot inhibitors
Cell membrane disrupters
Growth regulators
Photosynthetic inhibitors
Amino acid synthesis inhibitors
Pigment inhibitors

15. Factors that affect the performance of herbicides.
16. Management, environmental, and crop factors involved in making herbicide recommendations.
17. Environmental factors affecting disease development.
18. Plant damage symptoms caused by nematodes.
19. Nematode management through cultural and chemical methods.
20. Fungicides for management of plant disease.
21. Distinguish between systemic and non-systemic fungicides.
22. Cultural management of plant diseases.
23. Identification of each of the following diseases by host-plant symptoms:

Phythium	Downey Mildew	Alternia
Phytophthora root rot	Texas root rot	Powdery mildew
Rhizoctonia	Fusarium wilt	Leaf crumple

24. Identification and classification (by feeding habits, crops attacked, life cycle, and type of metamorphosis) of the following:

<u>Pests</u>

Twelve striped Western flea beetle	Loopers
Pink bollworm	Boll/Bud worm
Whitefly	Lygus
Egyptian alfalfa weevil	Cut worms
Common stink bug	Brown Lacewing
Thrip/citrus thrip	Green Lacewing
Mites	Corn earworm
Perforator	Fall armyworm
Aphid	Cotton boll weevil

<u>Beneficials</u>

Minute pirate bugs	Brown/Green Lacewing
Lady beetles	Nabids
Assassin	Big eyed bug
Spider	Striped collops beetle

25. Identify damage of insects to crop - Refer to question #24
26. Distinguish between contact insecticides, stomach poisons, and systemic insecticides.
27. Timing of insecticide applications.

28. Physical characteristics of pesticide formulations.
    - Water soluble liquids
    - Water soluble powders
    - Emulsifiable concentrates
    - Water dispersible granules
    - Pellets
    - Granules
    - Wettable powders
    - Genetic engineering
29. Use of information found on a label to determine proper pesticide use.
30. Pattern form, relative droplet size, pattern overlap, and primary uses of the following nozzle types:
    - Standard flat fan
    - Even flat fan
    - Hollow cone
    - Flood tip
31. Factors affecting nozzle selection to achieve a desired application rate.
32. Factors influencing, management of, and ways to prevent the development of pesticide resistant weeds, disease and insects.
33. Pesticide resistance and tolerance.
34. Effect of soil moisture and temperature on pesticide degradation.
35. Difference between factors affecting spray drift and spray volatilization.
    - Climatic conditions
    - Pesticide formulation and property
    - Additives
36. The principles of field scouting.
    a. cultural practices
        1. resistant varieties
    b. economic threshold of weeds, insects, and diseases
    c. economic injury levels
37. Advantages and limitations of integrated pest management.
38. Effect of soil and pesticide properties on the movement of pesticides in soil or into surface or ground water.
    - Soil texture
    - Leaching
    - Erosion and erosion control practices
    - Pesticide adsorption
    - Pesticide degradation and persistence
    - Source of entry into the environment
    - Depth of water table
    - Precipitation and runoff
    - Pesticide application rate and timing
39. Given a situation, make economically and environmentally sound pest management recommendations.
40. Principles of organic farming
    - approved chemicals and fertilizers
    - awareness of existing organic regulations

<u>CROP MANAGEMENT</u>

1. Effect of temperature extremes on growth and development of crops.
2. Water needs throughout the growth and development of crops.
3. Heat limit day concept and it function in crop production systems.
4. Consequences of seeding too early or too late.
5. Factors that influence the planting of agronomically important crops.
6. Recommended seeding depths of agronomically important crops and factors affecting these.
    - Environmental conditions
    - Calendar date
7. Crop response to depth of planting and seeding rate.
8. Growth stages when crops are most susceptible to environmental stress.
9. Crop damage levels which justify replanting and factors affecting those decisions.
    - Calendar date
    - Environmental conditions
    - Stand
10. Advantages and limitations of monoculture versus crop rotations.
11. Crop response to planting pattern and plant population (seeding rate).
12. Seed quality effects on crop growth and development.
13. Scheduling harvest of crops.
14. Defoliants/Dessicarits
15. PGR's

REGULATORY

1. Understanding point and non-point sources of pollution.
2. Management practices which reduce point and non-point source contamination.
3. Factors affecting pesticide movement in soil and potential groundwater contamination.
   - Soil texture
   - Climate
   - Soil organic matter
   - Water table depth
   - Pesticide properties
   - Underground storage tanks
   - Solid waste disposal (chemical containers)
   - Burning
   - Used oil
   - Pesticide storage
4. Pesticide mode of entry into the human system
5. Poisoning
   - Chronic
   - Acute
   - Symptoms
6. Procedures to follow if pesticide gets on the skin, in the eyes, in the mouth or stomach, or is inhaled.
7. Pesticide label and MSDS information.
   - Toxicity levels
   - First aid procedures
   - Environmental hazards
   - Handling precaution
   - Safety information
8. Az pesticide use reporting (1080's)
9. Protective gear used during mixing and application of pesticides.
10. Cleanup procedures for application equipment and protective gear.
11. Procedures for disposal of pesticides and containers.
12. Safe storage of pesticides
13. Reporting and cleanup procedures for pesticide spills.
14. Pesticide record keeping requirements.
15. Regulatory agencies and their duties.
16. The national FIFRA legislation.
17. Water Quality Act of 1987.
    a. Az best management practices for Nitrogen
       1. Nutrient management plan
       2. Goal statements
18. Worker Protection Standards.
19. Violative use of pesticides (not in accordance with labels).
20. Buffer zone
21. PMA's
22. Environmental and Mechanical factors affecting drift.
23. Endangered Species Act
24. Water Quality Act (Fed & State standards)
25. Air Quality
    - P_{10}
    - Fugitive dust
    - Drift, volatility, odifurous