



Agricultural Practices and Environmental Factors that Affect Alkaloid Accumulation in Tobacco

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Agricultural and Environmental Factors 101



- Genetics
- Nitrogen Rates
- Plant Population
- Topping Height (Number of Leaves)
- Sucker Control
- Stalk Position
- Soil Type
- Rainfall/Irrigation
- Day-Length

Alkaloids:



- Most alkaloids are formed in the root and translocated and stored in the leaves (nornicotine is formed in the leaf)
- Nicotine is the major alkaloid in tobacco
- Any factor which increases the size of the root system in proportion to the size of the top of the plant can result in increased leaf nicotine content
- Any factor which decreases the size of the root system and increases the size of the top of the plant can result in decreased leaf nicotine content

Genetics:



- Greatest factor influencing nicotine in tobacco is genetics
- Prior to 1964 there was immense variability between varieties in both nicotine and sugar content, resulting in year to year blend variability
- Minimum Standards Program established through Tobacco Workers Conference 1963-1964 (nicotine standard +15% to -20% mean of the controls)

Nitrogen Rates:

- Higher nitrogen rates can result in higher leaf nicotine content
- Lower nitrogen rates can result in lower leaf nicotine content and increased sugar content
- Nitrogen molecules are used in nicotine formation
- Nitrogen is highly leachable in soils, greater in sandy soils than in clay soils

Plant Populations:

- Lower plant populations can result in higher leaf nicotine content due to larger root systems
- Higher plant populations can result in lower leaf nicotine content due to smaller root systems

Topping Height (Number of Leaves):

- Higher leaf counts can result in lower leaf nicotine content due to increased leaf area in which to store nicotine from the root, therefore it is less concentrated
- Lower leaf counts can result in higher leaf nicotine content due to decreased leaf area in which to store nicotine from the root, therefore it is more concentrated

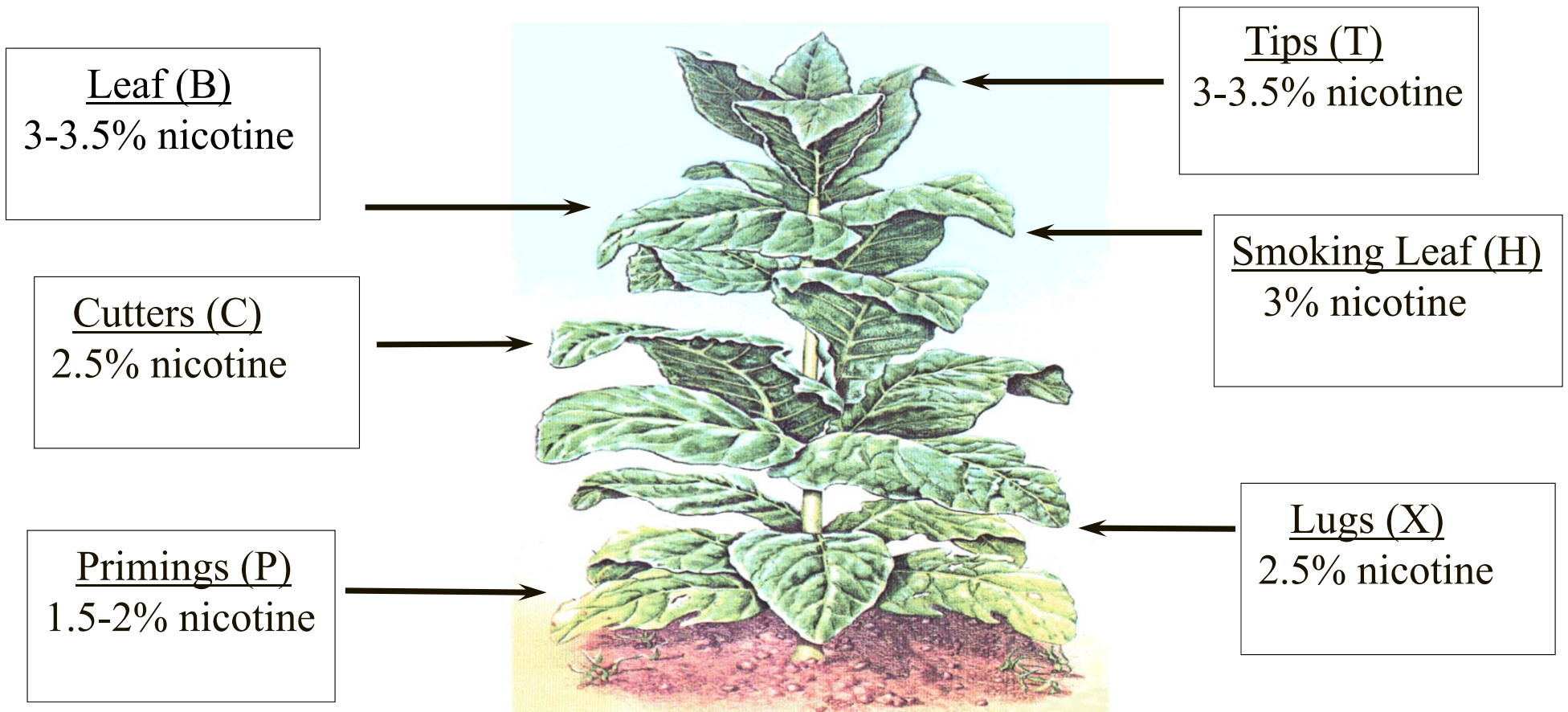
Sucker Control:



- After topping apical dominance is removed allowing sucker growth to occur in each leaf axial
- Removal and treatment with chemicals will control regrowth and results in increased leaf nicotine content
- Sucker growth left uncontrolled will result in decreased leaf nicotine content
- Uncontrolled sucker growth results in the risk of lodging due to wind damage, higher farm labor costs, increased insecticide use with potentially higher chemical residues, poor leaf quality and undesirable sensory attributes

Stalk Position: Flue-Cured Tobacco Plant

(adapted from NCSU Tobacco Guide)



Environmental Factors:

- **Soil Type**

- Clay soils: less leaching can result in higher leaf nicotine content
- Sandy soils: highly leachable can result in lower leaf nicotine content

- **Rainfall/Irrigation**

- Dry season: less leaching of nitrogen, roots grow in search of water, can result in higher leaf nicotine content
- Wet season: more leaching of nitrogen, roots do not need to grow as much to find water, can result in lower leaf nicotine content

- **Day-Length**

- Longer hours of daylight/longer growing season: greater time for accumulation, can result in higher leaf nicotine content
- Shorter hours of daylight/shorter growing season: less time for accumulation, can result in lower leaf nicotine content

Summary: Lower % Nicotine

- Varieties
- Lower nitrogen rates
- Higher plant populations
- Un-topped (higher leaf count per plant)
- No sucker control
- Lower stalk positions
- Sandy soil types
- High rainfall/irrigation
- Short day-lengths/Short growing seasons

Summary: Higher % Nicotine

- Varieties
- Higher nitrogen rates
- Lower plant populations
- Lower topping height (leaf count per plant)
- Control all suckers
- Upper stalk positions
- Clay soils
- Low rainfall/irrigation
- Long day-lengths/Long growing seasons

Questions/Comments:

