2023 CORESTA Agro-Phyto Webinar

Low Nicotine Tobacco - Current Insight & Perspectives for the Agricultural Production of Raw Materials

5 December 2023 | 2:00 pm to 3:30 pm CET

PROGRAMME

2:00 pm – 2:05 pm	Webinar Introduction	**Matthew Vann**, PhD Webinar Chair
2:05 pm – 2:25 pm	Opportunities to Use Modified Plant Genetics to Reduce Tobacco Nicotine Levels	**Ramsey Lewis**, PhD University Faculty Scholar Distinguished Professor of Plant Breeding Dept. of Crop & Soil Sciences NC State University
2:25 pm – 2:45 pm	Breeding for Low Nicotine Tobacco Varieties and Impact of Lower Alkaloids Lines on Plant Defense	**Anna Malpica**, PhD Breeder and R&D Manager Bergerac Seed & Breeding
2:45 pm – 3:05 pm	Agronomic Practices for Low Nicotine Tobacco Production	**David Reed**, PhD Extension Agronomist, Tobacco Southern Piedmont AREC Virginia Tech University
3:05 pm – 3:30 pm	Audience Q&A following speakers presentations	Moderated by **Stewart LIVESAY** Universal Leaf Tobacco Company

WORKSHOP ABSTRACTS

Low Nicotine Tobacco - Current Insight & Perspectives for the Agricultural Production of Raw Materials

Low nicotine tobacco (<0.5 mg/g) and proposed standards from regulatory entities remain a key challenge within the industry. The transition from traditional production to low nicotine production systems will impact all stages of crop growth and management. For example, the current suite of commercially available varieties are unlikely to meet the proposed nicotine limit; therefore, new varieties will be required by interested producers. Moreover, crop management practices have traditionally been developed to secure acceptable yield and alkaloid balance for a diverse range of tobacco-based products. Therefore, alternative agricultural practices will have to be developed for low nicotine tobaccos. This webinar seeks to highlight our current understanding of low nicotine production capabilities as well as the successes and failures of applied research in the areas of genetics and agronomy.

Opportunities to Use Modified Plant Genetics to Reduce Tobacco Nicotine Levels

The potential for mandated lowering of cigarette nicotine levels by various regulatory agencies has caused increased interest in development of tobacco cultivars with lower potential for accumulation of this alkaloid. The suggested threshold level of tolerance has been 0.4 mg/g, or below. Few, if any, tobacco cultivars currently exist that would *routinely* meet this ultra-low nicotine content when grown under conventional agronomic management, however. We have produced and evaluated a series of new non-GMO and non-gene edited genetic combinations for alkaloid accumulation in different field experiments. A number of these materials accumulate nicotine at levels far lower than previously described genotypes. Data suggest that some new genotypes could routinely produce cured leaf with nicotine levels (averaged over all stalk positions) below the currently suggested level of nicotine concentration of 0.4 mg/g. Corresponding changes in yield and quality characteristics will be reported.

Breeding for Low Nicotine Tobacco Varieties and Impact of Lower Alkaloids Lines on Plant Defense

Nicotine is typically the most abundant alkaloid that accumulates in cultivated tobacco (*Nicotiana tabacum*). The development of low nicotine lines (between 5 and 10 mg/g) has been an important part of Bergerac Seed and Breeding (BSB) projects since the 70ies and the increase of demand for filler leaves for flue-cured, Burley and dark air cured typologies. 70% of the French production is still today focused on shisha tobacco which is associated to the use of low nicotine flue-cured varieties cumulated to a low nicotine crop management and a temperate climate. More recently regulatory agencies have been working on new regulations lowering nicotine levels in cigarettes to below a predicted threshold level for addiction of 0.4 mg/g (World Health Organization, 2015 and Food and Drug Administration, 2018). BSB have been consequently focusing on more experimental projects on these ultra-low nicotine targets by combining QTLs to mutations in genes known to be associated to nicotine biosynthesis. The impact, of low nicotine and ultra-low nicotine lines coming from BSB programs on yield and quality, have been evaluated during the last 7 years. More recently, trials have been organized to evaluate the impact of these nicotine reduced lines on plant defence front to budworms (*Helicoverpa zea* and *Helicoverpa armigera*) and *Epitrix hirtipennis* showing some worrying results in a context of decrease of allowed insecticides CPA on tobacco in Europe and Worldwide. In parallel and in collaboration with field technicians and growers we developed an adapted crop management guideline for low nicotine variety production.

Agronomic Practices for Low Nicotine Tobacco Production

Nicotine is synthesized in the roots of tobacco plants and transported to the leaves. The nicotine content of tobacco is impacted by multiple agronomic practices. Plant population, nitrogen fertilization rate, and topping procedure are among the easiest agronomic practices to alter with the intent of reducing nicotine content in the cured leaf. Field studies were conducted to evaluate these practices with both conventional (K 326) and low nicotine (LA FC53) flue-cued tobacco varieties. Increasing plant population and topping higher (thus increasing leaf number) had minimal impact on nicotine. Delaying topping time later than recommended for conventional tobacco production reduced nicotine levels and not topping the plants had the greatest effect. Reducing nitrogen rate had only marginal impact. None of these changes in agronomic practices (alone or in combination) consistently reduced the nicotine level of LA FC53 below 0.5%. Substantial differences were observed in nicotine levels between years with both the conventional and low nicotine varieties. The alternative agronomic practices evaluated had a negative impact on both the yield of quality of the cured tobacco.

BIOSKETCHES

Ramsey Lewis, PhD
University Faculty Scholar
Distinguished Professor of Plant Breeding
Department of Crop & Soil Sciences
NC State University

Ramsey Lewis is a University Faculty Scholar and is the Charles and Marilyn Stuber Distinguished Professor of Plant Breeding in the Crop and Soil Sciences Department at North Carolina State University. His program carries out research in the area of tobacco breeding and genetics. He is also responsible for maintaining the United States *Nicotiana* Germplasm Collection and supervising the NCSU Tobacco Analytical Services Laboratory. Additionally, he teaches a course in plant breeding at NCSU.

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Anna Malpica, PhD
Breeder and R&D Manager
Bergerac Seed & Breeding

Since 2016, Anna Malpica is tobacco breeder in Bergerac Seed and breeding, heir organization from the Bergerac Tobacco Institute, based in South France and focused on delivering improved tobacco varieties. She is graduated with an Engineer degree in Agronomy, plant biology, genetics and breeding and started her career as vegetable breeder and project coordinator in Rijk Zwaan and Syngenta. She has participated in CORESTA meetings since 2016 and joined the LNTP Sub-Group in 2019, where she currently serves as the secretary and is a field trial executor.

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David Reed, PhD
Extension Agronomist, Tobacco
Southern Piedmont AREC
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David Reed has been the Extension tobacco agronomist for Virginia Tech since 1990 and is located in Blackstone, Virginia at the Southern Piedmont Agricultural Research and Extension Center. His research interests include greenhouse transplant production, tobacco yield limiting factors, production factors impacting tobacco leaf chemistry, curing efficiency and new technology, and production practices impacting the cost of production and tobacco quality.

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