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Evaluation of ULT Prototypes Having High Temperature Heated Extract  
G7s Which Contain Levulinic Acid and/or KDN Effluent

**OBJECTIVE:**

To evaluate the use of four unique G7 materials in ULT prototypes which incorporate heat treated extracts (TBFs) where levulinic acid (O-150) and KDN effluent are used in the preparation of the extracts.

**SUMMARY:**

The four unique G7 sheets were added to a Winston King Size blend at a 25% inclusion rate. The TBFs used in the G7 sheets were prepared employing spray dried C-dust tobacco and glutamine using either water or KDN effluent as the liquid phase. The TBFs were heat treated at 180 degrees C for 30 minutes in a Parr Bomb. Ultra low "tar" cigarettes (4) were prepared in the Vantage Ultra Lt configuration employing these unique G7s. These test products were compared against two reference cigarettes: Marlboro LT and Vantage Ultra Lt. Analytical and informal sensory responses (20 person panel) were obtained. Statistical evaluations were conducted to determine the effects of levulinic acid and KDN effluent on the smoke chemistry of the test and control products. Additionally, the sensory effects of the

products containing the unique G7's were compared to the inmarket reference products.

#### **CONCLUSIONS:**

This experiment has shown that a ULT product which incorporates the use of heat treated extract G7 containing both KDN and levulinic acid can achieve equivalent preference ratings to a Marlboro LT product, while having a 28% reduction in "tar" and a 38% reduction in T/N ratio. Surprisingly, this ULT product exhibited dramatically different attribute ratings versus both inmarket products (Vantage ULT and Marlboro LT). This ULT product had a smoke nicotine value of .89 mg/cigt and a "tar" yield of 7.3 mg. The levulinic acid smoke yield was 0.36 mg/cigt.

#### **STATUS:**

The results of this study will be presented to the XB/LF Team.  
Recommendations will be made to have similar prototypes evaluated by consumers.

#### **KEYWORDS:**

Levulinic acid, ULT, XB, KDN effluent, FTC analyses, informal smoking, TBF

## RESULTS AND DISCUSSION:

### I. Sensory Results

#### Considering the products containing the 4 experimental G7s

The presence of KDN increased the sensation of: spicy and unlit tobacco aroma, and preference; and decreased the sensation of: bitterness and drying. The presence of levulinic acid decreased the perception of: throat impact, mouth sensation and aftertaste. These results are consistent with prior consumer learning.

#### Considering the 4 prototypes as compared to inmarket products

Differences among the 6 products were found for all attributes (14) except resistance to draw. In terms of preference, Marlboro Lt, Vantage Ultra Lt and the prototype containing both KDN and levulinic acid in the tobacco based flavor extract were equivalent. In general, the Marlboro Lt and Vantage ULT products had the highest levels of lit tobacco perceptions. The product with KDN and O-150 (prototype C), in general, ranked the lowest on lit tobacco perceptions and aftertaste dimensions. Prototype C exhibited the highest level of unlit tobacco aroma among all 6 tested cigarettes. The prototype with no levulinic acid or KDN (prototype A) performed closest to the inmarket products on attributes, but was the least preferred.

### II. Analytical Results

#### Considering the products containing the 4 experimental G7s

The FTC analyses comparing the 4 test prototypes were equivalent in all respects except for the smoke yields of levulinic acid and nicotine which were part of the design. In terms of the special smoke analyses, there were no significant differences in the hydroxybenzene analyses among the 4 test prototypes. The presence of KDN increased the ammonia yield and smoke pH, and decreased the acetone and acrolein yields. The presence of levulinic acid decreased the ammonia yield and smoke pH.

#### Considering the 4 prototypes as compared to inmarket products

All of the FTC yields were higher for the Marlboro Lt product relative to the Vantage ULT and the 4 prototypes.

Appendix 1 contain the statistical analyses of the sensory results. Appendix 2 contains the statistical analyses of the analytical results. Appendix 3 contains the informal panel ballot employed and a summary of the individual panelist responses.