NuBana™

GREEN BANANA FLOUR

Clean Label, Whole Fruit for Texture & Nutrition

NATURAL HEALTH PRODUCTS NZ®

The collective voice of the natural health products industry of New Zealand

Trudy Ringrose
Business Manager - Nutrition
23 August 2018

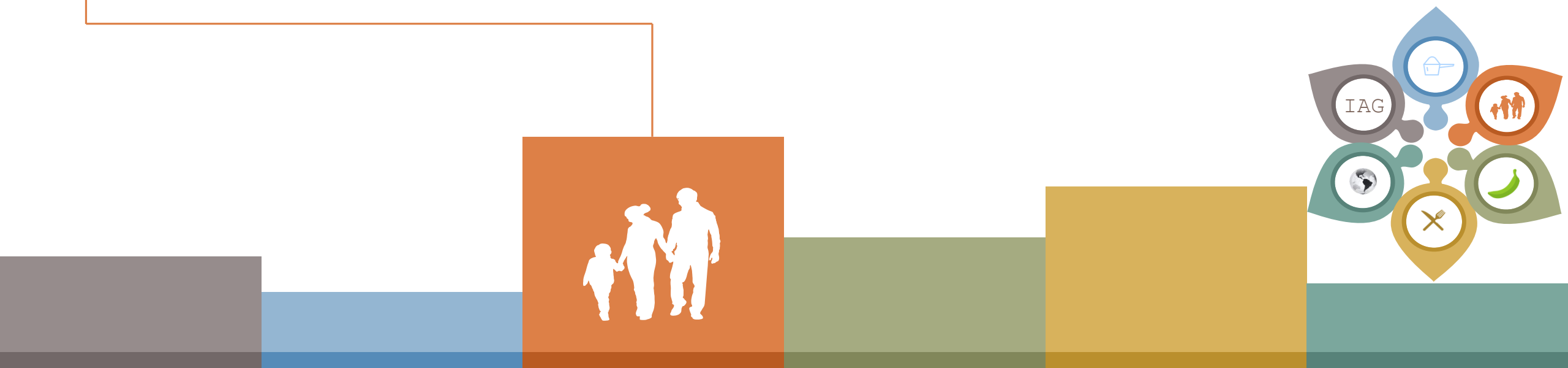
CHEMIPLAS
Creating Solutions

NuBana™

GREEN BANANA FLOUR

All-Natural, 'Whole Food' Fruit for Clean Label & Health

- The functionality of a starch with a fruit label
- Whole food health benefits without the sugar or the taste of ripe bananas
- Sustainable source



NuBana™
GREEN BANANA FLOUR

Reduces Food Waste

NATIONAL GEOGRAPHIC

By Elizabeth Royte

PUBLISHED OCTOBER 26, 2016

A Third of All Food Never Gets Eaten. How Can We Fix This?

We squander enough food to feed everyone suffering from hunger more than twice over.

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Social Responsibility & Sustainability

IAG focuses on what matters most:

People, Planet and Performance

We are committed to continually identifying best practice, effective, and dually-beneficial programs to reduce our environmental impact, positively impacting the communities in which we operate, and ultimately contribute to a world capable of effectively sustaining future generations, while supporting improved returns.

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NuBana™
GREEN BANANA FLOUR

Key Properties

- 100% Whole Fruit
- Non-GMO, organic available
- Gluten free
- Kosher & Halal
- Smooth, free flowing powder
- pH range: 4.8-5.2
- Light beige color
- Mild to neutral aroma and flavor
- 18 month shelf life
- Rich in resistant starch, potassium, magnesium
- Superior water binding & texturizing properties
- Labelling:
  - dried green bananas,
  - green banana flour, or
  - green banana powder

NuBana™
GREEN BANANA FLOUR

Whole Food Solution

- ✓ 100% Whole Food
- ✓ Minimally-processed
- ✓ High nutrient content
- ✓ Clean label
- ✓ Vegan
- ✓ Non-GMO

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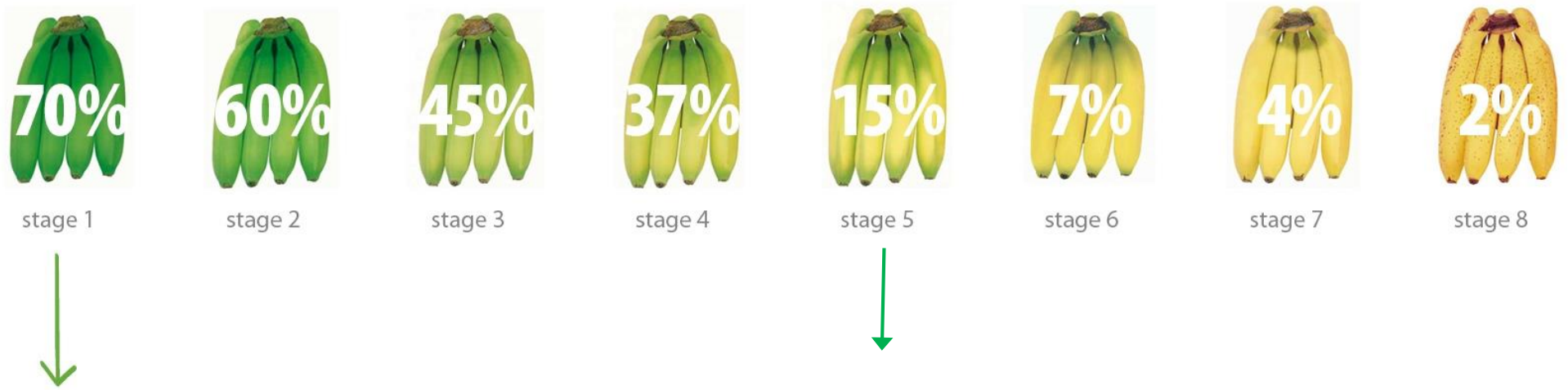
What makes bananas unique?

Bananas are the **only fruit** with a large percentage of *naturally* occurring starch.

Amount of starch in bananas at each stage:



>80% starch, No Sugar
Mild, earthy taste and aroma
Long shelf life & reduced food waste

Commonly appear in grocery stores at this stage.
Sweet
Short shelf-life & tremendous food waste

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Nutritional Benefits – Fibre

Resistant Starch (starch that resists digestion in the small intestine)

- Low glycemic, reduced sugars released in small intestine
- Promotes digestive health
- Increases insulin sensitivity
    - Helps maintain healthy blood sugar levels
    - May help with satiety and weight management
- Insoluble dietary fibre is inherent in green bananas
- Well tolerated – does not cause digestive complaints

Nutritional Benefits - Potassium

- Identified as a shortfall nutrient
- Important for muscle function, heart function and regulation of blood pressure
- Mandatory on Nutrition Facts Panels (USA, 2018)
- RDI – increasing from **3500mg to 4700mg** (USA, 2018), **3800mg NZ**

- Green Banana Flour delivers **1,100-1,400 mg potassium/100 grams**.

Nutrition Facts

Serving size	**100 g**
Amount Per Serving	
Calories	**260**
	% Daily Value*
Total Fat 1g	**1%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 0mg	**0%**
Total Carbohydrate 79g	**29%**
Dietary Fiber 25g	**89%**
Total Sugars 2g	
Includes 0g Added Sugars	**0%**
Protein 8g	**16%**
Vitamin D 0mcg	0%
Calcium 13.5mg	2%
Iron 8.5mg	45%
Potassium 1165mg	25%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

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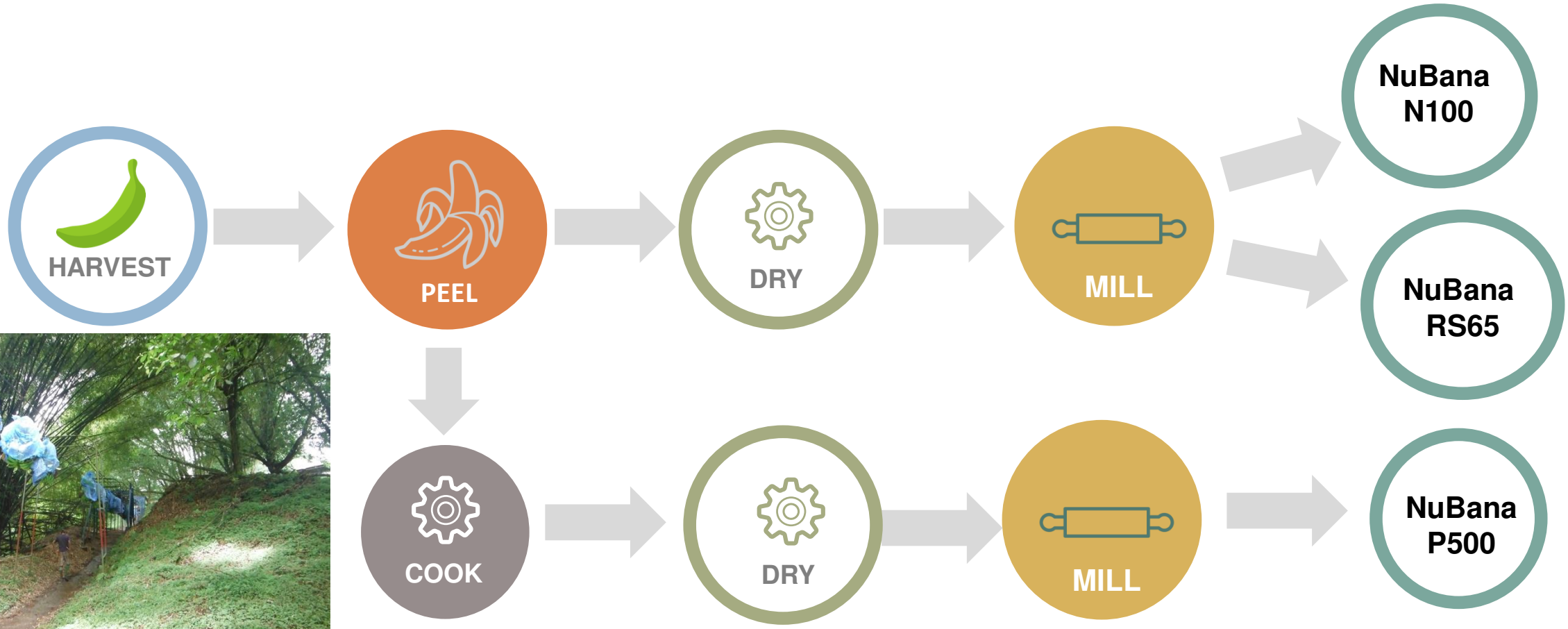
Nutritional Benefits - Magnesium

- Identified as shortfall nutrient by public health authorities
- Important for bone health, heart health and may relieve muscle aches and spasms
- Required co-factor for over 300 enzyme systems
    - Protein synthesis, muscle and nerve function, blood glucose control, blood pressure regulation
- **RDI – 310-420 mg/day** for adults

- NuBana Green Ganana Flour delivers **100-120 mg/100g**

The NuBana™ Whole Food Process



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NuBana™ Product Line

N100

Texturizing native starch

Releases viscosity upon cooking

Excellent water binding

Good source of resistant starch

High viscosity after cooling

P500

Pregelatinzed starch

Viscous in cold water

High water absorption

Excellent water binding

Clean label texturizer

RS65

Nutritional native starch

Very high in resistant starch and slowly digestible starch

Insoluble dietary fibre

Releases viscosity upon cooking

High viscosity after cooling

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NuBana Starch Characteristics

- Greater than 80% starch
- Rich in amylopectin
- High in very long chains of amylopectin, which deliver interesting textural properties

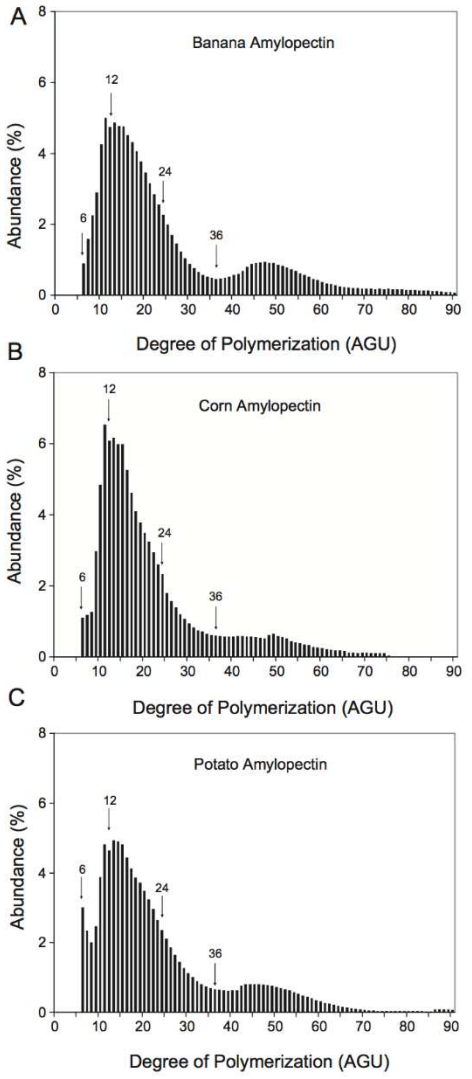

Fig. 2. Chain length distribution of isoamylase-debranched banana amylopectin (A), corn amylopectin (B), potato amylopectin (C) from determined by HPAEC–PAD.

Banana
21% DP>36

Corn
13% DP>36

Potato
19% DP>36

Zhang and Hamaker, "Banana starch structure and digestibility" *Carbohydrate Polymers*, 2011

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Performance Characteristics

	NuBana™ N100	NuBana™ P500	NuBana™ RS65
Pasting & Gelatinization Temperature	75 ºC / 167 ºF	50 ºC / 122 ºF	74 ºC / 166 ºF
Water Absorption Capacity*	1.9	8.9	1.5
Resistant Starch Content	☑	☒	60-65%
Color	Light brown/beige	Light brown/beige	Tan
Final Setback Viscosity (12% solution)**	3,666 cP	2,290 cP	3,705 cP

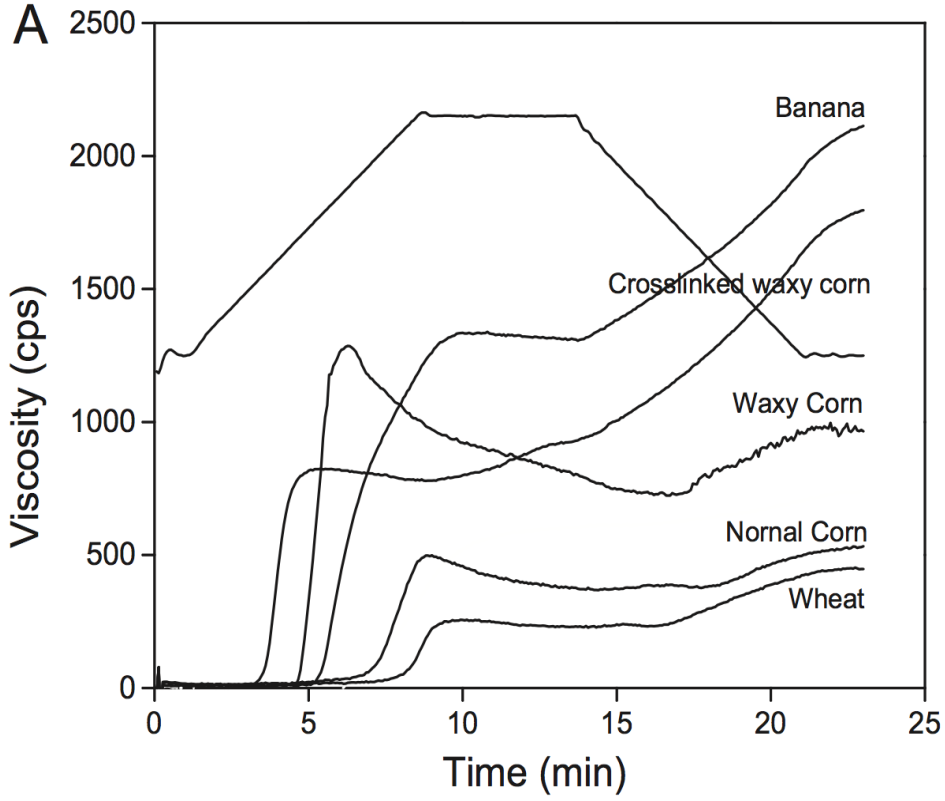
*Water absorption capacity tested according to method by Beauchat, 1977. Pre-weighed GBF samples were mixed with water, allowed to stand at room temperature and then centrifuged to separate the free water. The water absorption capacity is expressed as the grams of water bound per gram of dry flour.

** NuBana final setback viscosity is high compared to all purpose wheat flour at 1,900 cP, waxy corn starch at 1,915 cP, native rice starch at 2,958 cP and native tapioca starch at 2,362 cP, all under the same conditions.

NuBana offers Unique Textural Properties

- Comparable pasting viscosity to tapioca starch or waxy corn starch.
- It provides significantly more viscosity than wheat flour.
- Relatively low or no breakdown at lower concentrations.
- The viscosity after cooling is significantly higher than other starches.
  - Likely due to long amylopectin chains

RVA Profile



Zhang and Hamaker, "Banana starch structure and digestibility" *Carbohydrate Polymers*, 2011; 6% starch

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Viscosity: Green Banana vs. Corn

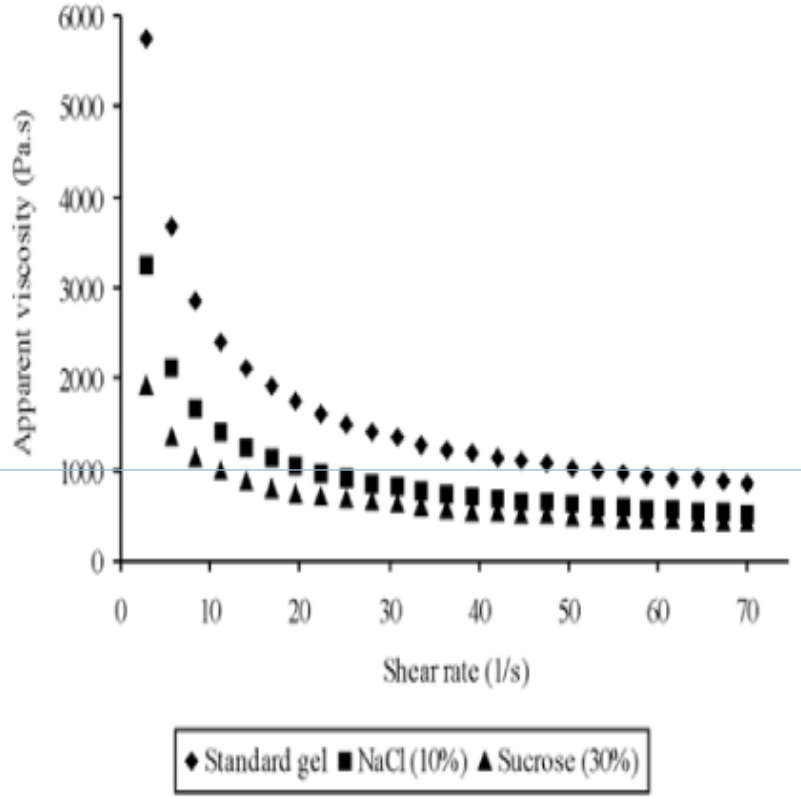

FIGURE 5 – Apparent viscosity of green banana gels at 25°C.

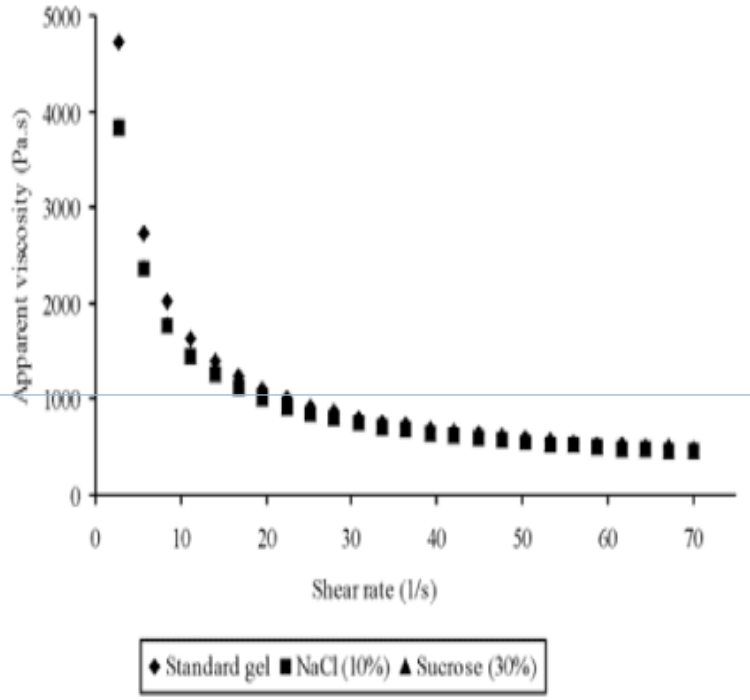

FIGURE 6 – Apparent viscosity of corn gels at 25°C.

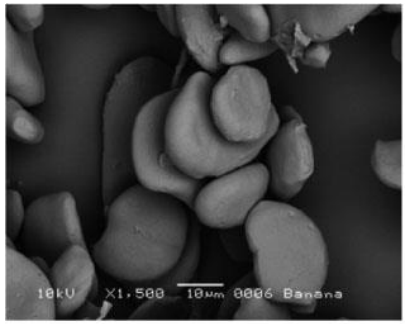

FIGURE 1 – Scanning electron micrographs of starch granules from green banana (1500 x).

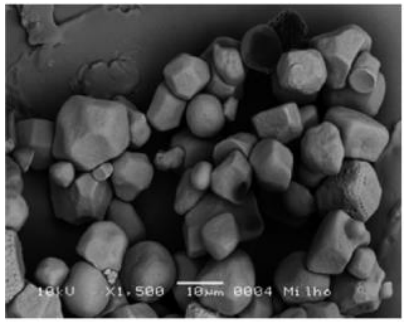

FIGURE 2 – Scanning electron micrographs of starch granules from corn (1500 x).

Banana starch gels show higher apparent viscosity and higher values of shear stress when compared to corn starch gels.

Source: Izidoro, CA, 2007

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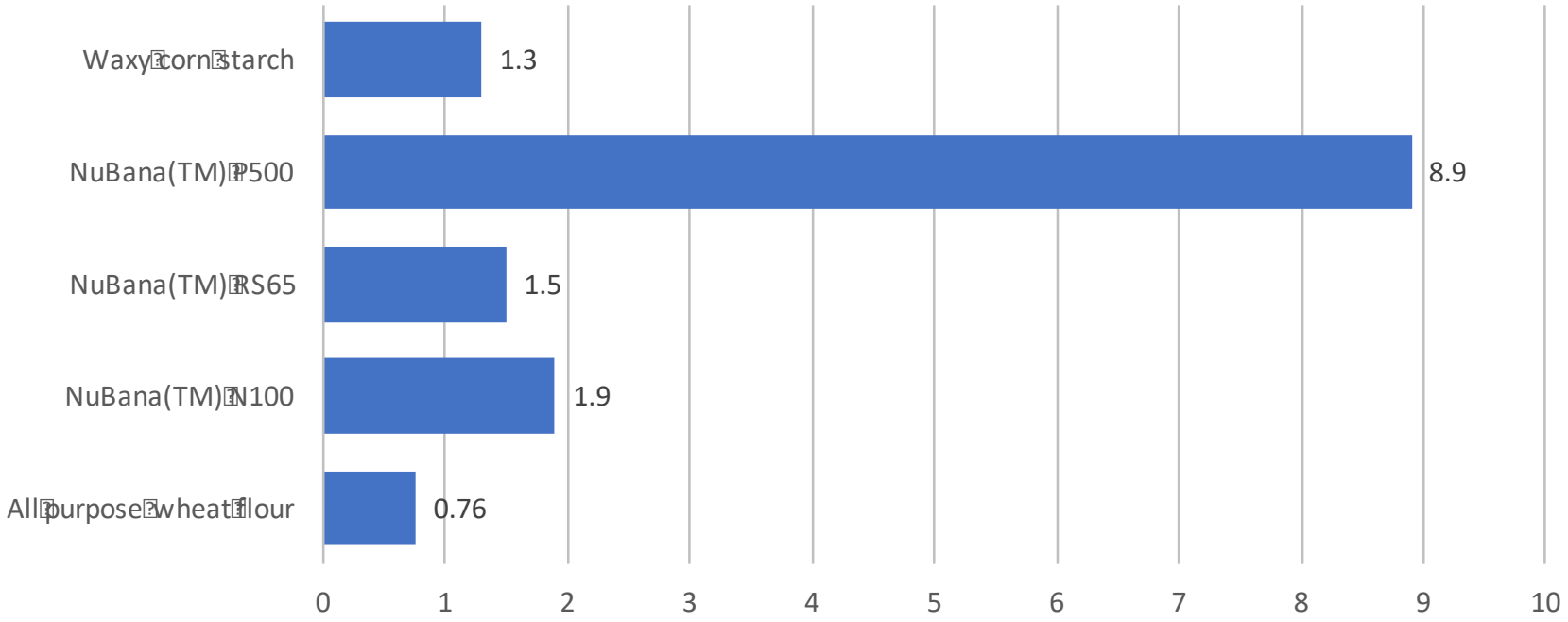
Water Absorption



Typical of pre-gelatinized starches, NuBana P500 holds significantly more water than the native flours. NuBana N100 and RS65 Green Banana Flour hold more water than wheat flour.

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Reduced Sugar Confection

30% less sugar, 30% more fruit

NuBana N100 replaced 30% of the added sugar in Fruit Roll-up Formulation.

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Gluten Free - Bread

Nubana has an ability to hold its high viscosity after cooking which can improve gluten free food texture.

NuBana may also replace other texturizers, including xanthan gum, in certain applications.

NuBana replaced 50% of the white rice flour and tapioca starch in this GF formulation.

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Gluten Free – Pizza Dough

NuBana™ P500 – provides dough softness and stretch in the initial rheology

NuBana™ N100 – provides viscosity and texture for a crispy crust.

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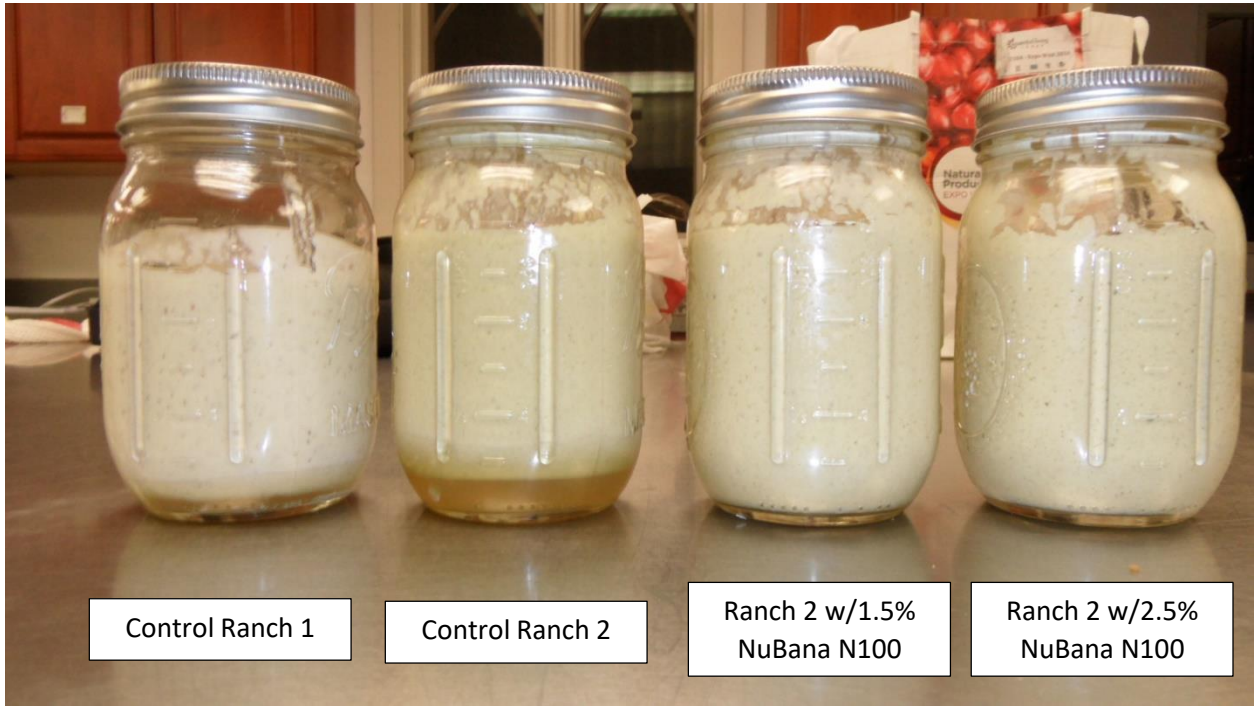
Clean Label Natural Ranch Dressing

Emulsion Stability

NuBana™ N100 was added to a natural ranch dressing formulation stabilized with egg yolk.

Refrigerated storage for 5 months Shows emulsion stability when NuBana used.

Control separated at week 5



* Viscosity measured by Brookfield Heliopath, 5 rpm, 50ºF

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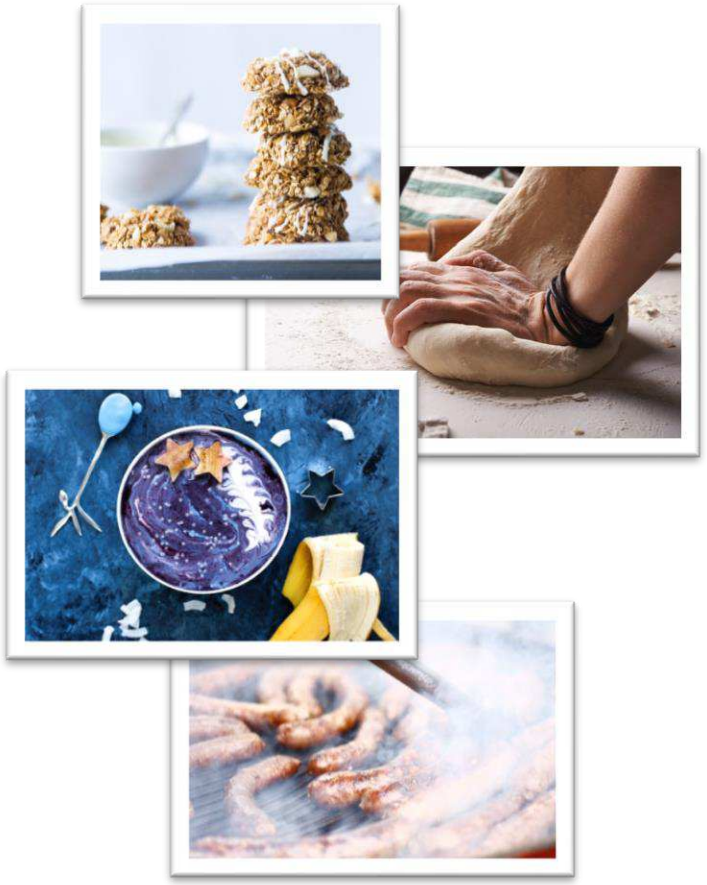
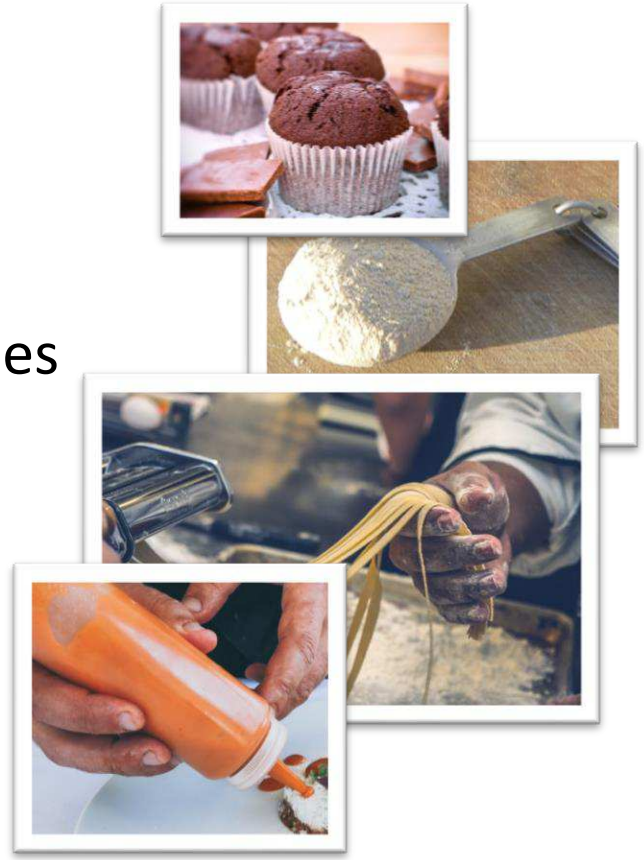
Applications



Nutrition Bars
Dairy
Pudding
Meats
Smoothies
Supplements
Fruit/Veg Juice

Bakery
Cereal
Sauces,
Dressings
Gluten Free
Pasta/Noodles
Snacks
Beverages



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