

RESEARCH BRIEF

COMPANION



PROOF OF CONCEPT: DENTAL STICK EXTRUSION UTILIZING SPRAY DRIED PLASMA

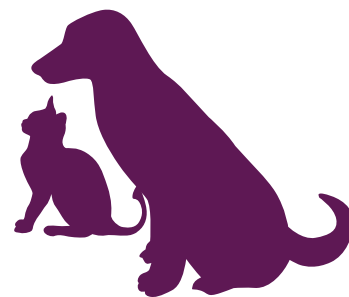
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BACKGROUND INFORMATION

Dental stick extrusion utilizes various ingredients to form the ideal texture and quality product. Alternative ingredients to enhance or impact texture, palatability and/or plaque removal can be useful to improve dental stick manufacturing. Spray dried plasma (SDP) is a consistent high protein ingredient commonly utilized in pet food for functional texture properties, enhancing palatability, and supporting overall health.

STUDY OBJECTIVE

The study objective was to evaluate how SDP inclusion with other ingredients impacts texture of extruded dental formulas.



EXPERIMENTAL PROCEDURE

Three formulas were developed utilizing SDP to replace wheat starch (WS) or Arabic gum in the control formula. The formulas were: Control: WS and gum; SDP1: SDP and WS replacing gum; and SDP2: SDP replacing WS and gum.

Dental sticks were made at the Extru-Tech technology testing center using a 525 single screw extruder with the product densification unit (PDU) removed and replaced with a mid-barrel valve and 3 cooling heads to cause densification. The sticks were manufactured as solid square sticks. Generally, a single screw with a PDU, or a traditional parallel-shaft twin screw is used to manufacture dental sticks. However, the equipment alterations used worked like a single screw with a PDU; thus, it would be expected that the results would translate to a traditional single screw configuration. Glycerin at 12% (% to dry feed rate) and chicken fat were added to the pre-conditioner at set rates to optimize expansion and product quality. Processing conditions were monitored and adjusted on the various formulations during production to optimize extrusion.

Texture was measured on a TA.XT Plus utilizing an adjustable bridge with a rounded-end knife probe for a 3-point bend. Dental sticks of 8 cm in length were placed over the two bridge spans spaced 5 cm apart to measure maximum force (hardness) and work to peak force (work to break) to determine texture parameters. Ten dental sticks per treatment were analyzed.

Dental stick extrusion utilizes various ingredients to form the ideal texture and quality product.

Presented at ASAS 2024



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TREATMENTS

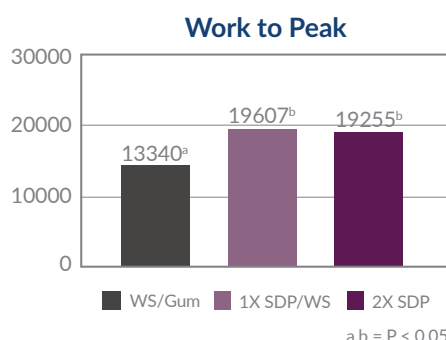
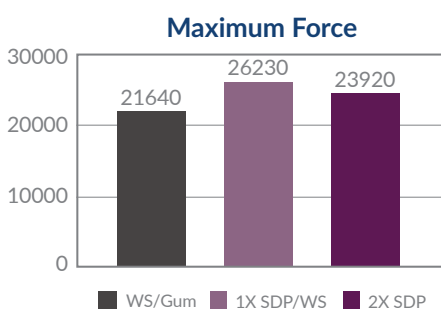
	WS/Gum	SDP/WS	SDP
DS Blend ¹	62.5	62.5	62.5
Wheat Starch	8.93	8.93	0
Arabic Gum	8.93	0	0
Gelatin	8.93	8.93	8.93
SDP	0	8.93	17.86
Glycerin	10.71	10.71	10.71
Sum	100	100	100

¹DS blend: Rice flour, calcium carbonate, chicken flavor, cellulose powder, sodium tripolyphosphate, potassium chloride, peppermint flavor, potassium sorbate, natural antioxidant, parsley, zinc sulfate, green tea extract, and titanium dioxide.

DENTAL STICK RUN CONDITIONS

	WS/Gum	SDP/WS	SDP
Feed Rate, lb/hr	400	400	400
Water, % Inj	11.98	17.15	24.2
RPM	150	412.5	350
Die Temp, F	80.25	89.25	89.3
MBV (% open)	3.34	11.9	23.79
Mass Rate, lb/hr	496.2	551.8	593.7
Load, % FLA	43.82	32.6	34.29
SME (HP*Hr/ton)	53	36	35

RESULTS AND DISCUSSION



- Plasma maintained or increased maximum force.

- Plasma increased work to peak.

SUMMARY

In conclusion, SDP can be incorporated into dental stick formulas and utilized as a processing aide. Overall, depending on target hardness and ingredient matrix, SDP can be an alternative to various ingredients to maintain or improve product quality.

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