

Spray dried plasma increases protein and meat inclusion in extruded dog kibbles

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Abstract: A common goal for pet food manufacturers extruding dry kibbles is to increase meat inclusion and protein content in both grain and grain free formulas. When extruding high meat formulas, variation of moisture and fat of the incoming raw meat ingredients adds to the complexity of producing consistent quality kibbles meeting all specifications. Spray dried plasma (SDP) is a consistent high protein ingredient commonly utilized in wet pet food for water binding and fat emulsification characteristics and in dry kibble extrusion with meat meals and other dry ingredients to produce quality kibbles. Thus, the objective of two studies was to evaluate if meat inclusion levels could be increased in extruded formulas with the use of SDP. Tests were done at the Wenger technology testing center to evaluate combinations of SDP levels ranging from 2.5 to 20% with meat level feed rates ranging from 25 to 50%. The ability to produce kibbles was conducted utilizing both grain free and grain formulations. Processing conditions were monitored on the various formulations during production along with kibble outcome measurements such as ability to extrude, solids, protein, and durability. In the first study, extrusion of grain free formulations with 0% SDP resulted in meat inclusion limit at 35% feed rate. Addition of 5, 10, and 15% SDP in grain free formulas increased protein content of the extruded kibble but meat inclusion was limited at 35% feed rate. However, use of 20% SDP in grain free formulas allowed for higher inclusion of meat from 35% and up to 45% feed rate while maintaining kibble quality and increasing protein. Extrusion of a grain formulation with 0% SDP also resulted in limits of 35% feed rate of meat inclusion. Addition of 2.5, 5, 10, or 20% SDP to grain formulations allowed for meat inclusion feed rate to be increased up to 50% depending on levels of SDP used, and protein was increased in all combinations. The second study was completed to evaluate a longer run extrusion measuring ability to extrude, cook, and durability. Grain free formulas were run at 35% feed rate of meat with 5, 10, or 20% SDP and maintained cook and durability. Grain formulas were run at 45% feed rate of meat with 2.5, 5, and 10% SDP and maintained durability with further optimization of cook needed. Overall, SDP included in the formulation allows for higher feed rate of meat inclusion and maintain or increase protein and durability in the dry kibble. Thus, depending on target meat inclusion feed rates or protein levels, SDP may be used during the extrusion process to produce dry kibbles with high meat inclusion.

BACKGROUND INFORMATION

Increasing fresh meat inclusion in dry kibble can be challenging. When extruding, variation of moisture and fat of the incoming raw meat ingredient adds to the complexity to produce quality kibbles. As fresh meat feed rates are increased, depending on the matrix, the ability to extrude quality kibble may be impacted. Spray dried plasma (SDP) has historically been used in wet pet foods to increase water holding, binding, and fat emulsification properties to maintain quality product.

STUDY OBJECTIVE

The objective of the two studies was to evaluate if meat inclusion levels could be increased in extruded formulas with the use of SDP.

EXPERIMENTAL PROCEDURE

Multiple test runs with grain or grain free formulas were completed on the TX 85 twin screw at the Wenger technology testing center to evaluate combinations of dry blend feed rates along with various SDP and fresh meat feed rates. The dry blend feed rate was established with target fresh meat feed rates to produce quality kibble. Once this was established, fresh meat feed rates were increased to determine limits with current matrix without the addition of SDP. Once limits were determined in the control, the extruder was cleaned out, reset, then the respective SDP feed rates were added with the dry blend to produce quality kibbles and fresh meat feed rates were again increased to determine limits. Limits of fresh meat feed rates were determined by the extruder inability to continue production of kibble. Focus of tests was on kibble quality while trying to maintain cook. Ranges of 2.5 to 20% SDP and 25-50% fresh meat were evaluated.

SPRAY DRIED PLASMA INCREASES PROTEIN AND MEAT INCLUSION IN EXTRUDED DOG KIBBLES

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RESULTS AND DISCUSSION

GRAIN FORMULA DOG KIBBLE CONTROL			
MEAT FEED RATE, %	PLASMA FEED RATE, %	CP, %	DURABILITY
25	0	31.2	98.6
35	0	31.3	No sample – soft kibble

- Control – good kibble at 25% fresh meat feed rate.
- Control limited at 35% fresh meat feed rate.

GRAIN FORMULA DOG KIBBLE – 2.5% SDP FEED RATE			
MEAT FEED RATE, %	PLASMA FEED RATE, %	CP, %	DURABILITY
25	2.5	33.0	97.49
30	2.5	33.1	98.00
35	2.5	33.0	98.60
40			RUN DISCONTINUED DUE TO INSUFFICIENT PRODUCT

- 2.5% SDP feed rate. Good kibbles from at 25 to 35% fresh meat feed rate.
- Limited at 35% fresh meat feed rate since ran out of dry blend for run.

GRAIN FORMULA DOG KIBBLE – 5% SDP FEED RATE			
MEAT FEED RATE, %	PLASMA FEED RATE, %	CP, %	DURABILITY
25	5	33.9	98.47
35	5	33.6	99.00
40	5	34.4	98.51
45	5	34.3	98.51

- 5% SDP feed rate. Good kibbles from at 25 to 45% fresh meat feed rate.
- Limited at 45% fresh meat feed rate.

GRAIN FORMULA DOG KIBBLE – 10% SDP FEED RATE			
MEAT FEED RATE, %	PLASMA FEED RATE, %	CP, %	DURABILITY
25	10	33.9	97.60
30	10	34.0	97.56
35	10	34.2	97.80
40	10	33.9	98.20
45	10	34.5	98.22

- 10% SDP feed rate. Good kibbles from at 25 to 45% fresh meat feed rate.
- Limited at 45% fresh meat feed rate.

GRAIN FORMULA DOG KIBBLE – 20% SDP FEED RATE			
MEAT FEED RATE, %	PLASMA FEED RATE, %	CP, %	DURABILITY
25	20	37.2	98.40
30	20	37.5	98.36
35	20	37.5	97.76
40	20	37.5	97.74
45	20	37.2	97.50
50	20	37.2	98.06

- 20% SDP feed rate. Good kibbles from at 25 to 50% fresh meat feed rate.
- Limited at 50% fresh meat feed rate.

GRAIN FREE FORMULA DOG KIBBLE CONTROL			
MEAT FEED RATE, %	PLASMA FEED RATE, %	CP, %	DURABILITY
30	0	33.7	No sample
35	0	34.1	98.68

- Control – good kibble up to 30% meat feed rate.
- Limited at 35% fresh meat feed rate.

GRAIN FREE FORMULA DOG KIBBLE – 5 to 20% SDP FEED RATE			
MEAT FEED RATE, %	PLASMA FEED RATE, %	CP, %	DURABILITY
25	5	35.2	99.00
25	10	36.7	98.85
25	15	38.1	98.49
30	20	39.1	98.61
35	20	38.4	99.25
40	20	39.7	98.48
45	20	39.6	99.40

- 5-20% SDP feed rates produced kibble up to 35% meat feed rate; however, no samples were collected with 35% meat feed rate.
- 20% SDP feed rate allowed for higher meat feed rate beyond 35% up to 45%.
- Limited at 50% fresh meat feed rate with 20% SDP.

SUMMARY

Overall, inclusion of SDP feed rates from 2.5 up to 20% in formulations allowed for increased fresh meat feed rates up to 50% depending on the feed rate of SDP and formulation type.



