



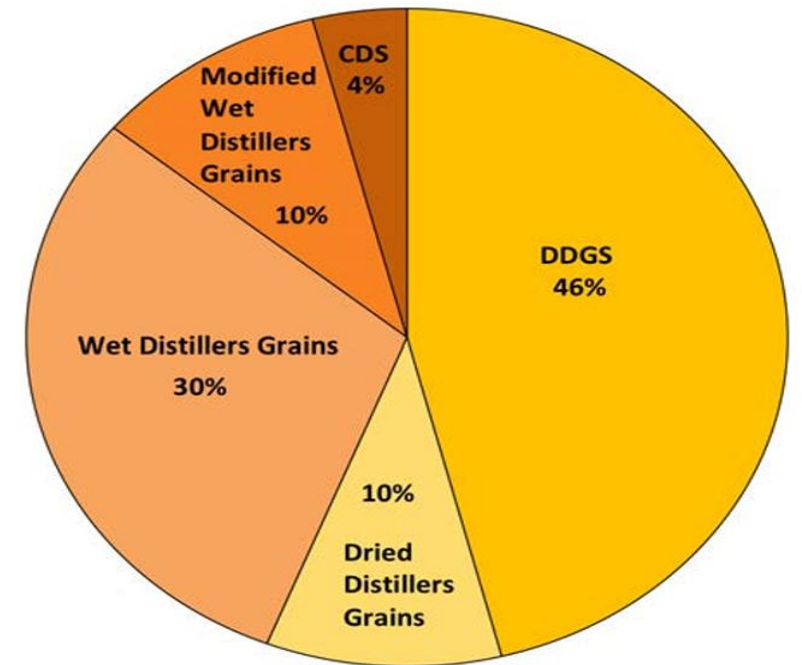
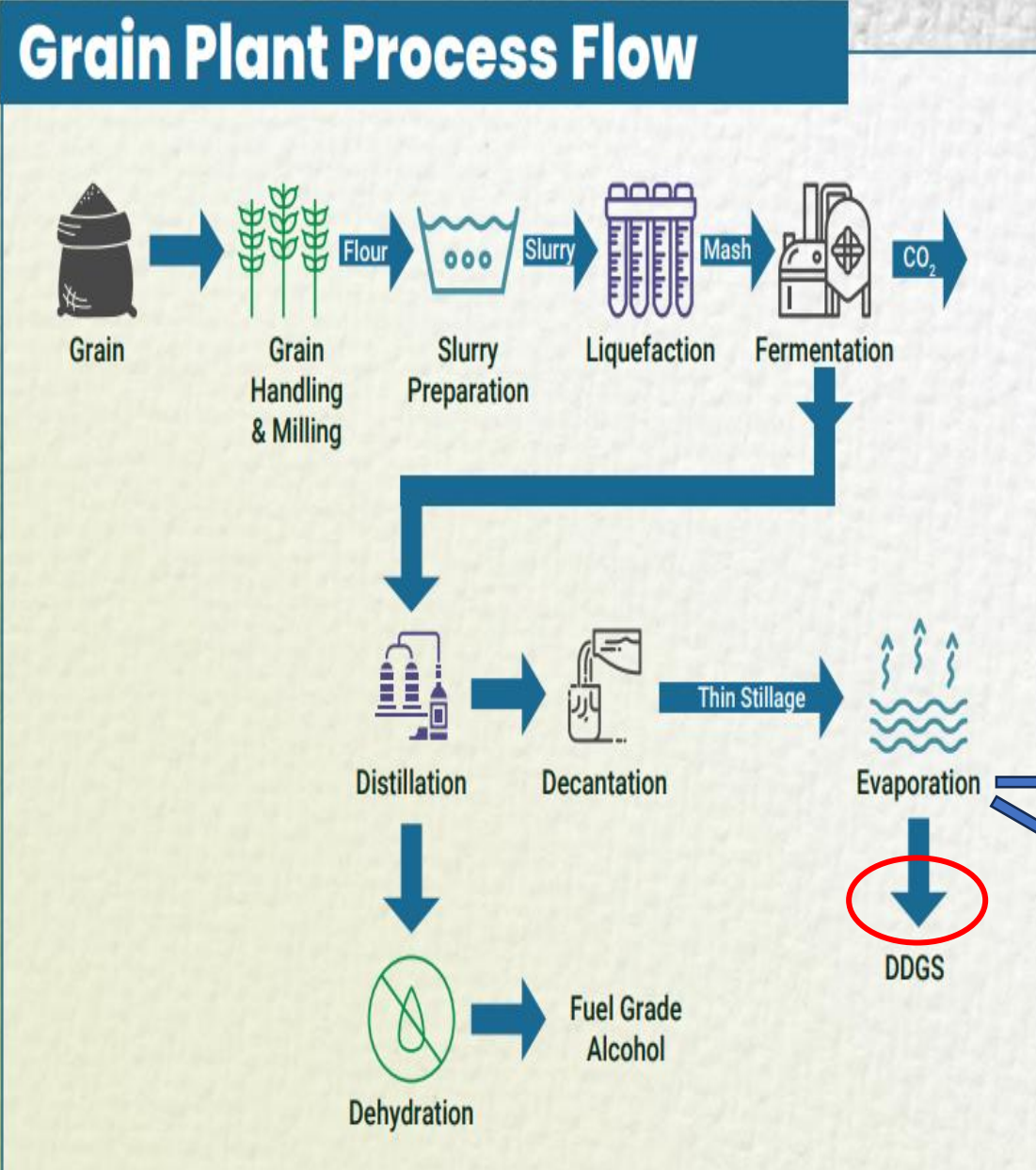
Use of DDGS in Animal Feeds



Dr. Amit Sharma
Assistant Professor

Guru Angad Dev Veterinary and Animal Sciences University Ludhiana

Introduction



Proportion of various types of byproducts in ethanol production

If the coarse grain fraction of the whole stillage is dried without addition of solubles then product is called distillers dried grains (DDG)

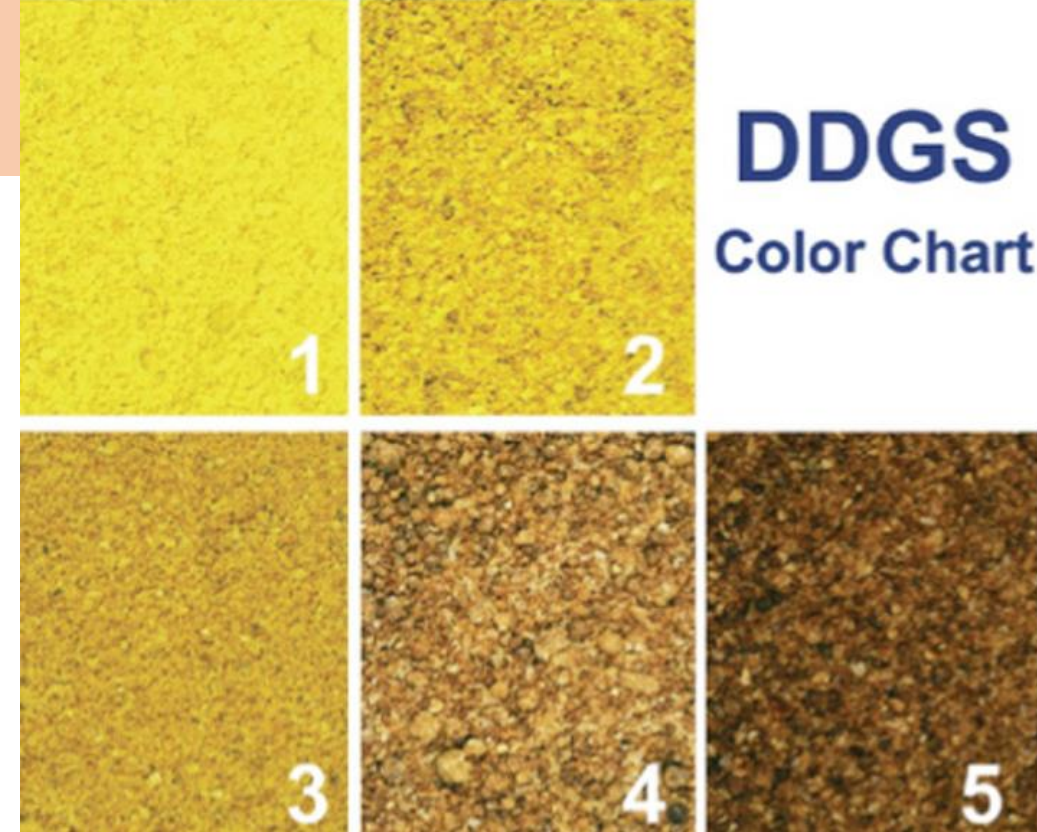
If the coarse grain fraction of the whole stillage is dried with addition of solubles then product is called distillers dried grains with solubles (DDGS)

Source: Ministry of Petroleum and Natural Gas, GOI

Nutritional and physical properties of DDGS

- **Physical properties**

- ✓ Color: very light to very dark
- ✓ Smell: normal to brunt or smoky



Nutritional profile:

CP approximately 30%
(73 % RUP and low level of ADIN)

Highly digestible fiber
40% NDF and 11% fat

Non starch polysaccharides (26 %)

Low lysine level (1)
Maize DDGS: Lysine and tryptophan 2)
Wheat DDGS: Lysine and threonine

Higher amount of available phosphorus

Factors affecting nutritional and physical properties of DDGS

Type of grain and their composition

How much solubles are being added

Modification in Processing Technologies

- Fine grinding, germ and germ-fiber removal
- Enzymatic milling processes
- Dilute-acid pretreatment (sulphuric acid increased sulphur content)
- Type of fermentation (continuous vs batch)
- Drying temperature and duration (the darker the color of DDGS more heat damage to protein)
- Processing technologies of the plant to ferment starch

Chemical composition of various DDGS

Parameter	Wheat DDGS	Corn DDGS	Mixed DDGS	Rice DDGS
DM	91.3-93.2	87.6-93.5	87.3-92.6	89.6-91.4
CP	30.3-37.9	27.1-36.4	33.8-38.3	44.7-48.4
EE	4.4-6.5	6.5-11.8	4.4-5.0	5.5-6.5
Ash	8.1-10.0	5.4-9.0	8.0-10.2	4.01-5.03
NDF	27.3-34.2	30.2-39.7	28.9-31.2	40.5-45.60
ADF	9.5-12.2	8.9-11.9	11.5-12.3	12.9-16.82
CF	5.5-8.8	6.4-9.5	5.6-7.6	9.12
Starch	<1.0-8.8	2.9-13.9	<1.0-3.7	-
Total sugars	4.6-12.4	5.4-12.6	9.9-14.2	-
Total NSP	25-33.7	24.2-29.1	23.8-25.7	-
S	0.39	0.72	0.37	-
Ca	0.18	0.05	0.15	-
P	0.91	0.77	0.92	-

Classification of DDGS and their chemical composition as per NASEM (2021)

Attributes	DDGS (high fat)	DDGS (high protein)	DDGS (low fat)
	Feed code: NRC16F59	Feed code: NRC16F60	Feed code: NRC16F61
DM	89.1	91.1	89.9
Ash	5.4	4.0	5.3
CP	30.2	39	31.0
RUP % CP	47	47	47
NDF	32.1	37.6	30.8
ADF	14.6	17.7	14.8
ADICP	2.85	3.97	3.15
Starch	4.5	6.2	6.1
Crude fat	12.54	7.56	8.90
DE (Mcal/kg)	3.49	3.34	3.44
Ca	0.12	0.08	0.11
P	0.88	0.64	0.89
S	0.67	0.64	0.71

Chemical composition of other ethanol By products

Attributes	Distillers' grains with solubles (DGS; modified wet) Feed code: NRC16F62	DGS (wet) Feed code: NRC16F63	Distiller solubles Feed code: NRC16F64
DM	49.2	33.2	31.2
Ash	5.6	4.5	11.1
CP	30.3	31.5	22.6
RUP % CP	44	42	25
NDF	27.1	31.7	4.8
ADF	14.4	16.1	3.2
ADICP	4.09	3.29	0.78
Starch	4.7	6.3	4.0
Crude fat	9.35	9.31	10.99
DE (Mcal/kg)	3.50	3.50	3.62
Ca	0.21	0.13	0.13
P	0.86	0.76	1.82
S	0.63	0.67	1.15

Utilisation of DDGS in livestock feed

DDGS is an excellent source of

Rumen undegradable protein

Highly digestible fibre which helps in the prevention of rumen acidosis

DDGS can serve as a bypass protein source at level < 15 % and an energy source at level > 15 % DM in the diet of ruminant

In pig and poultry inclusion of DDGS can replace a portion of corn, soybean meal, and inorganic phosphorus

Category	Inclusion level (maximum)
Pre weaned calves	25
Growing heifer	30
Dry cow	15
Lactating cows	20
Sheep and Goat	20
Pig	30
Poultry	10-20

Challenges and precautions of utilisation of DDGS

- **In ruminants:**

- ❖ **High level of PUFA :**

- ✓ Increased rumen unsaturated fatty acid load (RUFAL)
- ✓ Decreased DMI,
- ✓ Lower fiber digestibility
- ✓ Reduction in milk yield
- ✓ Milk fat depression
- ✓ Ration needs to be balanced for unsaturated fatty acids

- ❖ **High level of S:**

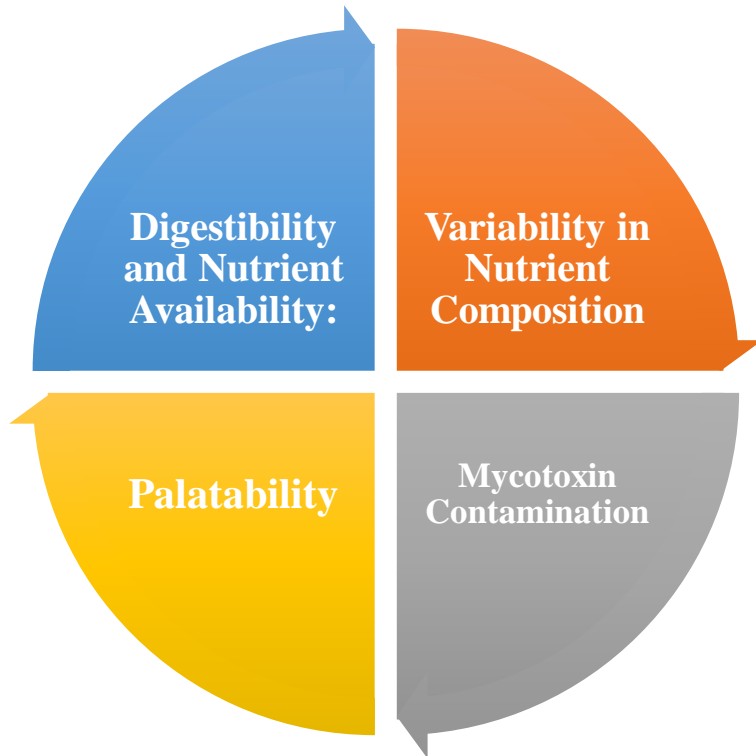
- ✓ Directly reduce rumen pH and fibre digestibility
- ✓ Decreases dietary cation-anion difference in the diet
- ✓ Supplemental S sources should be removed

- ❖ **Change manure characteristics:** Lower NH_3 emission and increase H_2S and P excretion

- **In monogastric:**

- ❖ **High level of NSP:** Use of exogenous enzymes

- ❖ Amino acid composition and ileal digestibility of limited essential amino acids



Conclusions

- Utilizing DDGS in livestock feed offers opportunities but requires careful formulation and quality control due to nutritional variability.
- Attention to factors like rumen unsaturated fatty acid load and DCAD is crucial for ruminants.
- Monogastric animals benefit from enzyme supplementation and optimized amino acid composition.
- DDGS's nutritional benefits enhance its potential as a valuable, sustainable feed ingredient for livestock animals .

A cartoon illustration of a brown and white cow standing in a green field. The cow has a speech bubble above it containing the word "Thanks". In the background, there is a large green watering can with a long handle, a globe of the Earth, and a blue sky with white clouds. A large mound of brown soil is visible on the left side of the image.

Thanks