



# Feed Analysis, current concepts, and developments

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## Recent Developments in Feed Analysis and Estimation of Anti Nutritional Factors

Moisture	Crude Protein	Crude Fibre
Crude Fat	Total Ash	Acid Insoluble Ash/Sand and Silica
Salt as NaCl	Calcium	Phosphorus
Aflatoxin by TLC	Other Mycotoxins by TLC	Dry Matter
Organic Matter	Magnesium	



## Specific tests that are rarely done



## The specific tests that are rarely done

### Essential and Toxic Minerals

Available Phosphorus	Iron	Copper
Manganese	Sulphur	N,P and K
Zinc	Fluorine	Iodine
Lead	Cadmium	Mercury
Arsenic	Chromium	Molybdate



# The specific tests that are rarely done

## Essential and Toxic Minerals

	Iron	Copper
Manganese	Sulphur	
Zinc	Fluorine	Iodine
Lead	Cadmium	Mercury
Arsenic	Chromium	Molybdenum



## The specific tests that are rarely done – Fatty Acids

### Omega-3 Fatty Acids

<b>Eicosa Pentaenoic Acid</b>	<b>20:5 (n-3)</b>	<b>Marine Source</b>
<b>Docosa Hexaenoic Acid</b>	<b>22:6 (n-3)</b>	<b>Marine Source</b>
<b><math>\alpha</math>-Linolenic acid (ALA)</b>	<b>18:3 (n-3)</b>	<b>Plant Source</b>

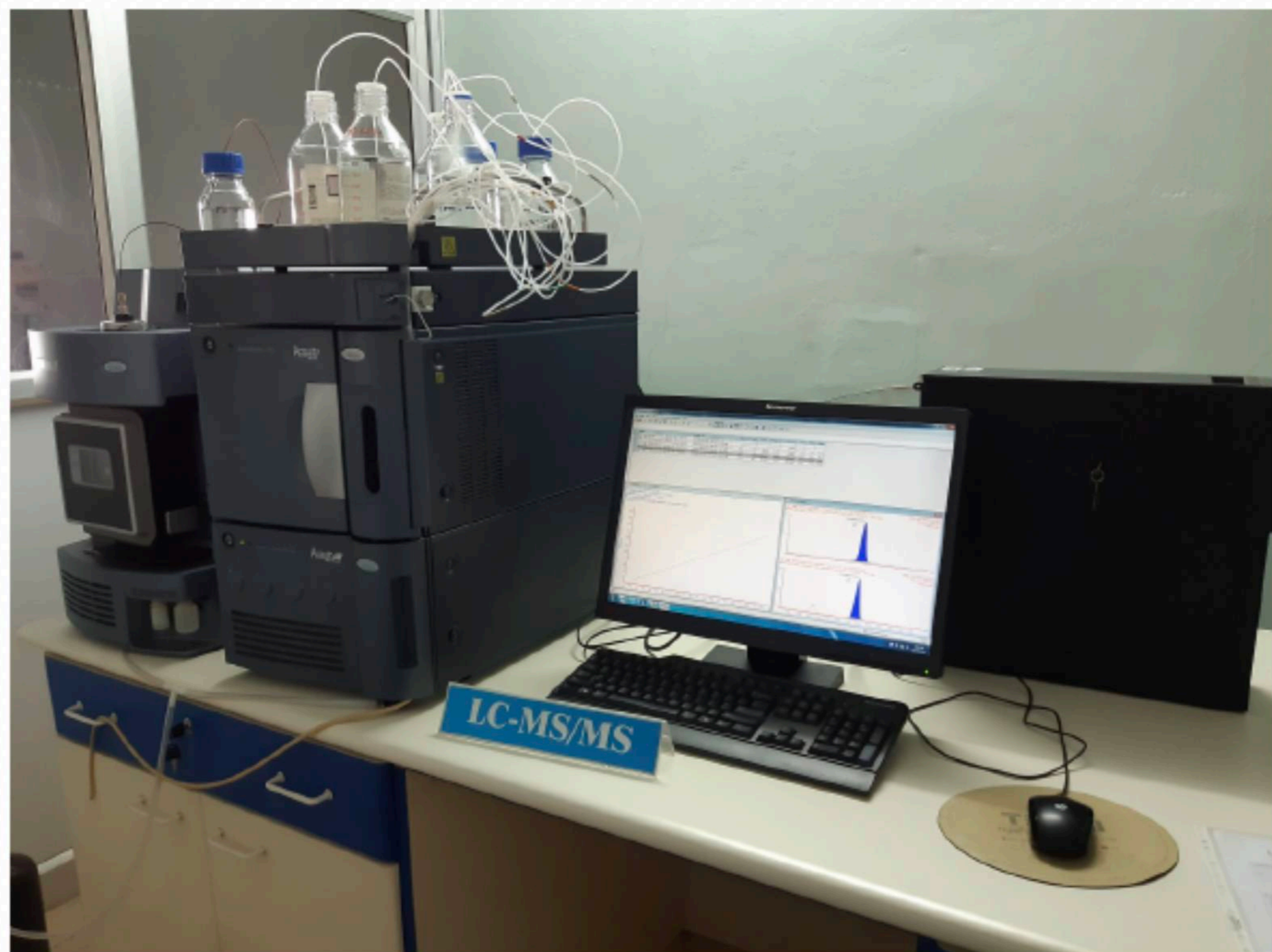




# The specific tests that are rarely done – Fatty Acids

## Aflatoxin M1 in Milk

	Tolerance ppb	Countries that regulate
<b>M1 in milk</b>	<b>0.15</b>	<b>60</b>





## Amino Acids in feed ingredients using HPLC

**Methionine**

**Lysine**

**Histidine**

**Threonine**

**Tryptophan**

**Arginine**

**Leucine**

**Isoleucine**

**Phenyl alanine**

**Valine**







## Vitamins using HPLC and Spectrophotometer

**Vitamin A**

**Vitamin D**

**Vitamin E**

**Vitamin K**

**Vitamin C**

**B-Complex  
Vitamins**





# Antibiotic Residues in Animal Feeds and Milk, Meat and Eggs using LC-MS/MS

Tetracyclines

Macrolides

Nitroimidazoles

Sulphonamides

Cocciostats

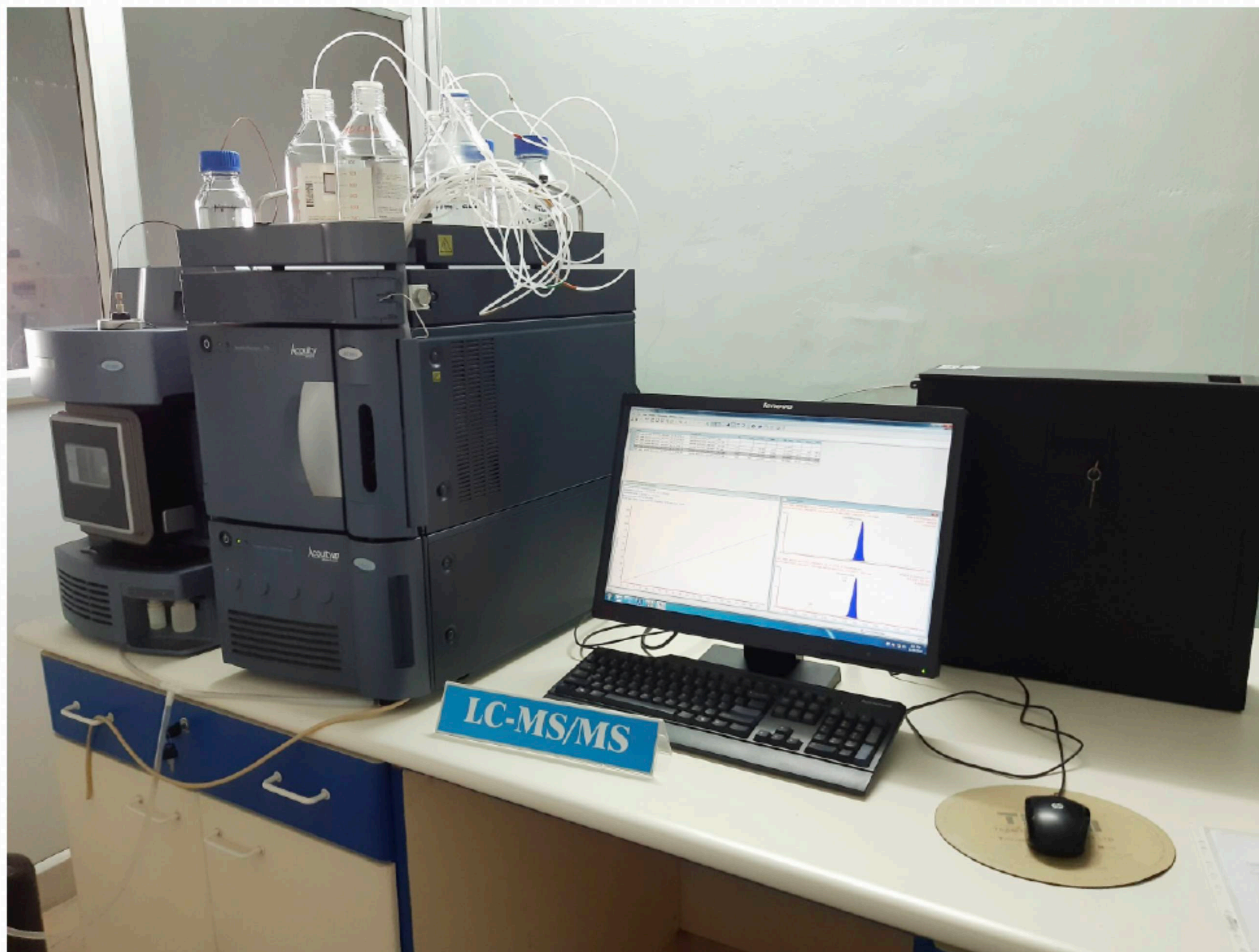
Aminoglycosides

Tetracyclines

Fluoroquinolones

Cephalosporins

Carbapenams





# Pesticide Residues in Animal Feeds and Milk, Meat and Eggs using LC-MS/MS

Organochlorine Compounds

Organophosphates

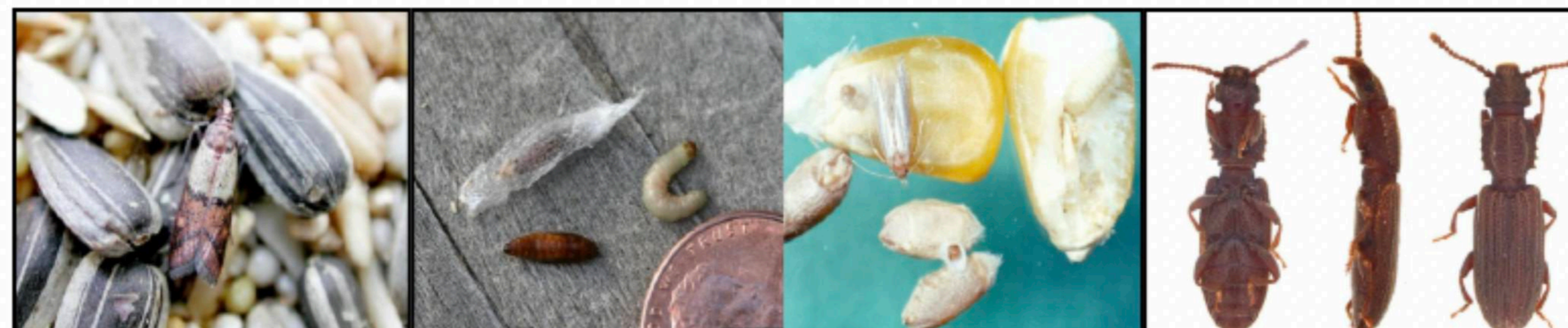
Carbamates

Insecticides

Herbicides

Rodenticides

Fungicides



Indian meal moth- adult, larva and pupae

Angoumois grain moth - adult, larva and pupa

Sawtoothed grain beetle - adult, larva and pupa



## Anti-Nutritional Factors

**They are present in almost all the feed ingredients**

**They cause different problems in different animals**

**They reduce the digestibility by destroying digestive enzyme  
(Tannin and Trypsin Inhibitor)**

**They bind with some nutrients and reduce their availability  
(Tannin and Avidin)**

**They cause lesser feed intake (Mimosine)**

**They cause health disorders and sometimes death  
(Ricin in castor seed cake, Hydrocyanic Acid)**

**They cause essential minerals not to be absorbed and cause bone and shell quality problems  
(Fluorine)**

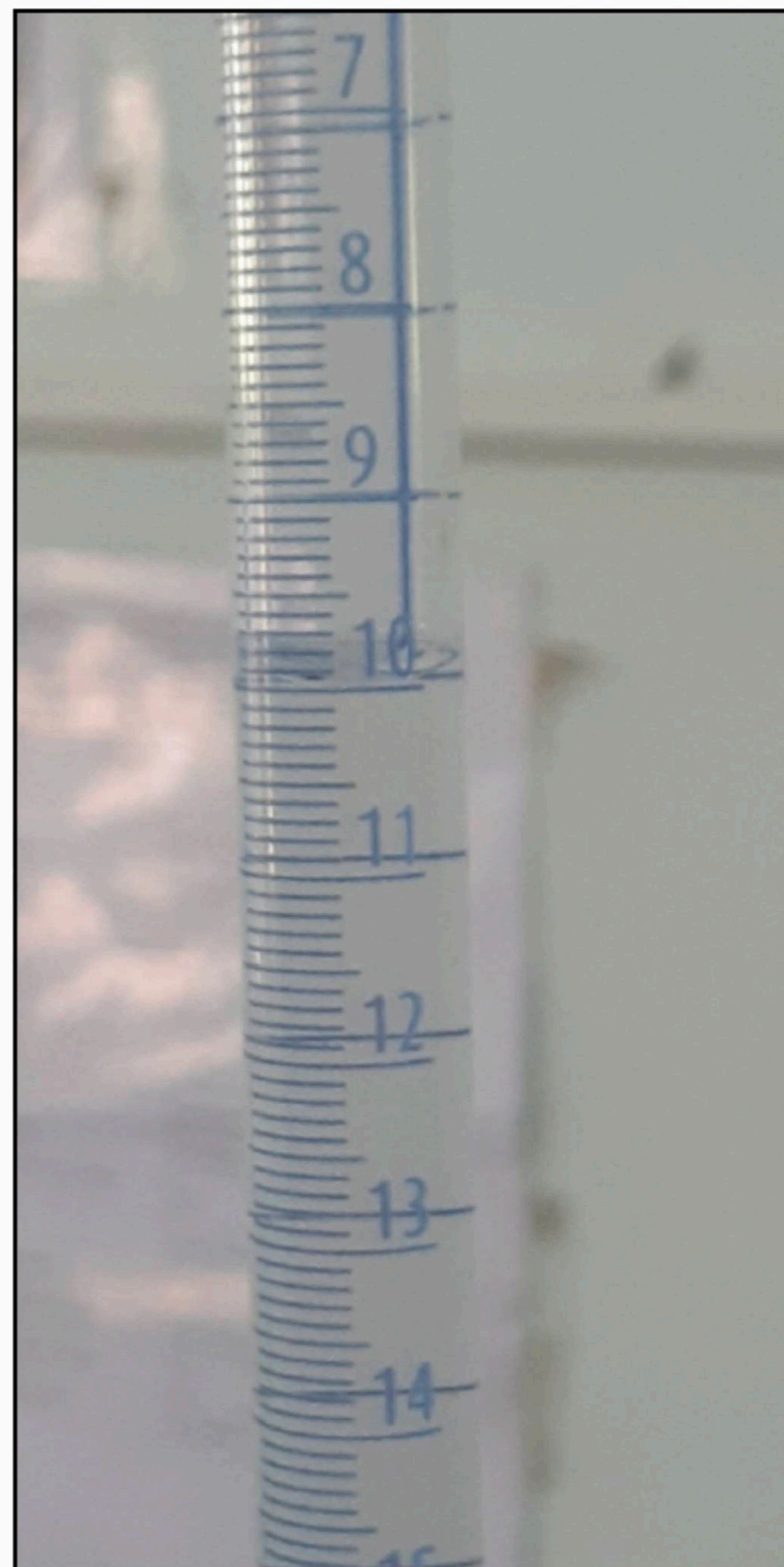
**They reduce the value of the feeds  
(Urea, Salt, Free Fatty Acids in oils)**

## Oxalate in straws, Stovers and crop residues

### Oxalate in dry fodder

Safe Limit is < 1.5 %

> 2.0 – 2.25 % causes calcium binding and denial to animals (Calcium oxalate)





## Nitrate in green fodders in drinking water

### Nitrate in greed fodder

Safe Limit is less than 3000 ppm

> 6000 ppm should not be given to pregnant animals

> 10000 ppm causes in-cordination

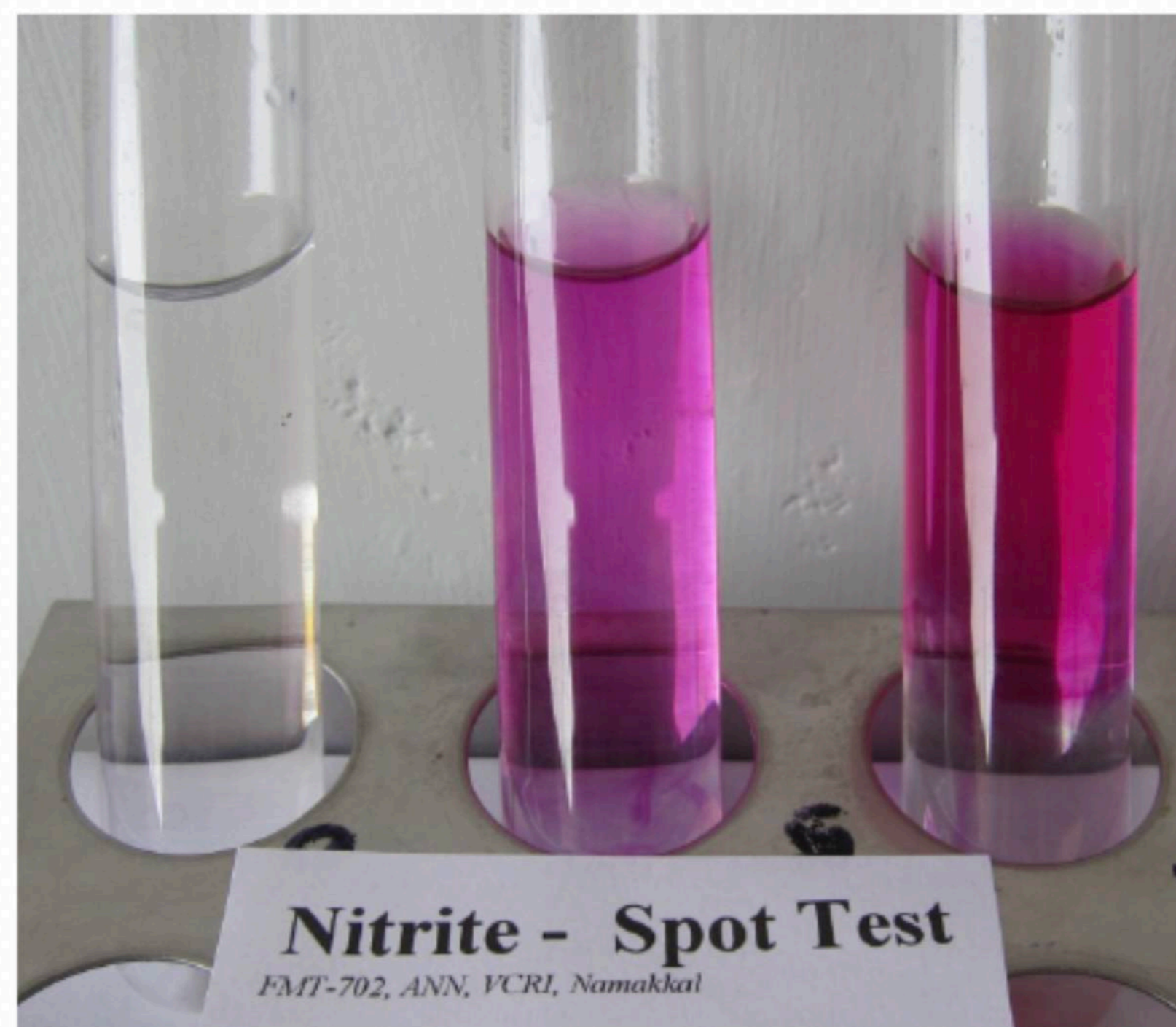
➤ 17500 ppm causes potential toxicity.

Consumption in quicker time causes death in vulnerable animals

### Nitrate in water

Safe Limit is < 100 ppm

> 300 ppm causes disturbance





## Estimation of Urea in feed, rumen liquor and water

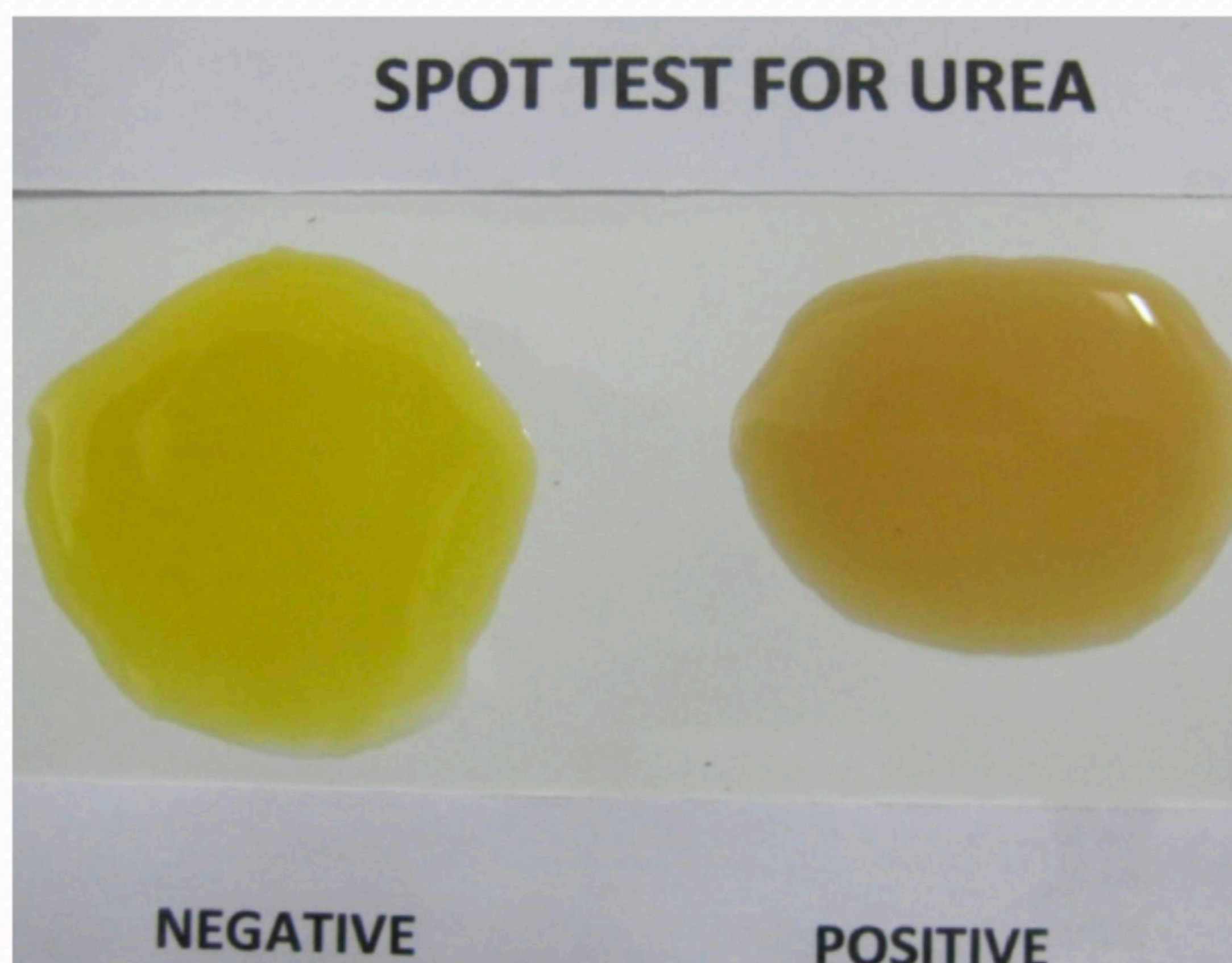
### Urea in feeds and raw materials

Urea supplies nitrogen and hence is added as an adulterant to elevate the level of protein in proteinaceous feed ingredients

Also added in cattle feeds in order to supply Nitrogen for the rumen microbes to manufacture microbial protein

In some countries, urea is permitted in cattle feed but the limit is only 1.0 %

In excess, it causes ammonia toxicity to the animals



## Soluble Protein in Soybean Meal

**Soluble protein is the portion of protein that gets solubilised in weak alkali solution**

**It gives an idea whether soybean meal is heat-processed in an optimum level  
Because treating soybean meal with heat is the requirement for removal of Trypsin Inhibitor**

**Incomplete TI removal causes protein to indigested and also causes digestive disturbance**

**Excess heating not only completely removes the TI but also causes true protein to be destroyed partially**

**Hence, a test of soluble protein to know the % solubility (85-90 % is normal)**







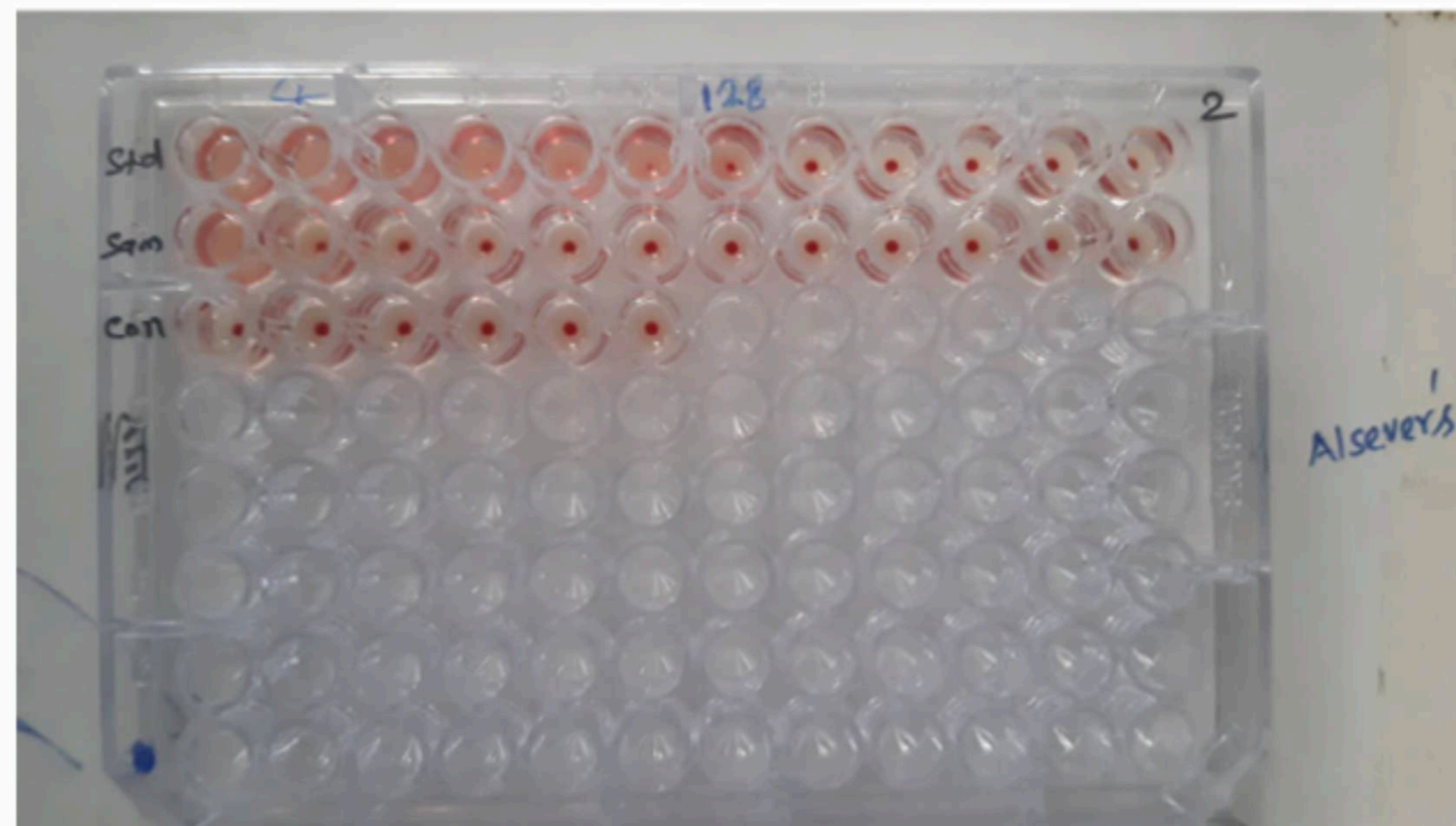
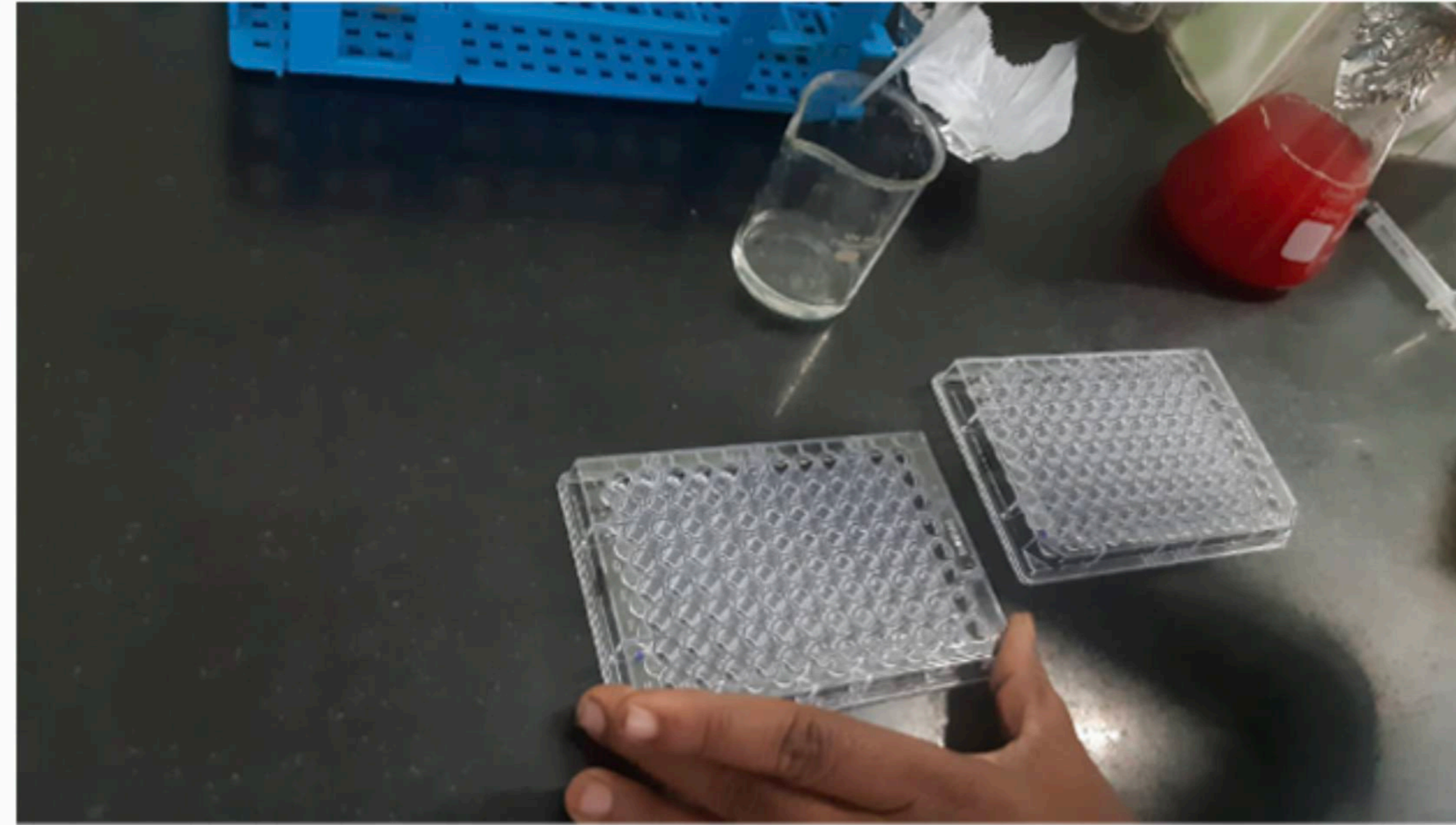
# Adulteration of High Protein Meal with Castor Seed Cake

Castor Seed Cake is poisonous to animals due to presence of toxic principle Ricin

Presence of Ricin, the alkaloid, in a spot test using the common method of Haem Agglutination test

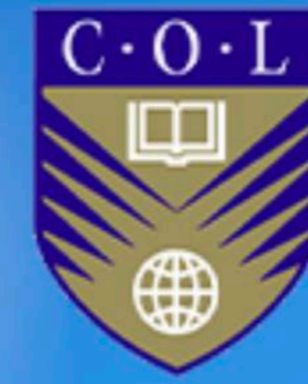
Chicken blood is used in the HA plate with suspected sample by simple extraction keeping a control and a standard of castor cake extract

Agglutination occurs when RICIN is present and the agglutination in more dilutions level means higher level of RICIN contamination



## To conclude....

- ▶ There are **good number of instrumental and spot tests** for finding both minute nutrients and anti-nutritional factors
- ▶ The **spot tests are for screening the samples** and further quantification is done with laboratory methods
- ▶ Choose a **third party reliable accredited laboratory** and keep testing the samples for knowing the nutrient contents and ANFs which are currently very important and relevant in the background reality of high performing animals



*Thank you*