



## Know the different product forms

In order to achieve the best performance of an anticoccidial program the molecule should be properly dosed and mixed into the feed, so each and every bird on the farm receives the same adequate amount of the anticoccidial drug.

If some birds are underdosed then they will not be adequately protected, suffer subclinical or even clinical coccidiosis and increase the infection pressure on the farm by an excessive shedding of oocysts. On the other hand, if some birds are overdosed, they might experience side effects – feed refusal, decreased BWG, locomotory or neural disorders like lameness and even increased mortality.

For this reason, proper dosing and mixing, but also a good product form is essential.

Anticoccidial products come in a number of different forms including both granulated products, where the active ingredient is distributed within the granules during the granule production process (such as spray drying, high shear granulation, roll compaction etc.) and simple mixtures of the active ingredient with different carriers. The product form characteristics – particle shape and size distribution, uniformity, durability and content of the active in the fines and dust determines the physical characteristics and, consequently, the performance of the anticoccidial in the feed mill when these products are blended into a premix or feed.

The physical form is important for the quality of the mixture and for the greater or lesser risk of cross contamination between feeds and premix, especially for product of high risk for non-target species (ionophores, nicarbazin, halofuginone).

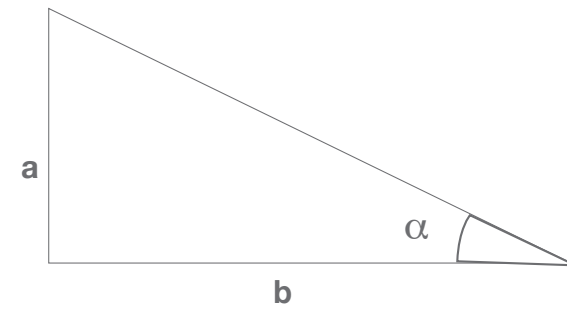
Granulation reduces the potential for dust and improves the flowability of the product. With less dust this can reduce the amount of fine material remaining on the walls of the equipment and utensils, and therefore, lower the risk of contamination of non-target feeds. (cross contamination).

Phibro carried out an evaluation with the IPT (Institute of Technological Research of the State of São Paulo - Brazil), at the Chemical Process and Particle Technology Laboratory of the Center for Process and Products Technology in 2012, with the objective of determining flowability properties of some anticoccidial products available on the market. Some of the parameters evaluated, as well as the results are listed below and in Table 1.

**Angle of repose** – it is an indirect measure for which we can estimate the flowability of a product in the premix and feed production lines. The smaller the angle of repose, the lower the piles are formed and the easier it is to flow.

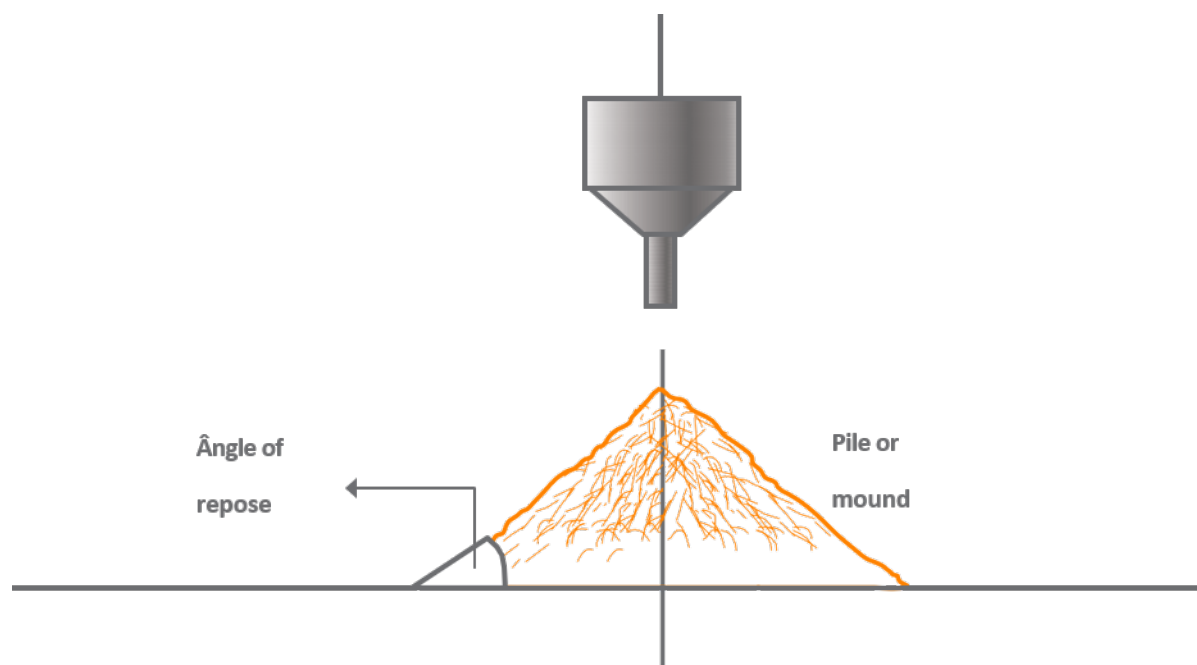
**Reference Values:**

- 25-30° - excellent flowability;
- 31-35° - good flowability;
- 36-40° - acceptable flowability;
- 41-45° - reasonable flowability;
- 46-55° - poor flowability;
- 56-65° - very poor flowability;
- Above 65° - extremely poor flowability (USP, 2006).



**Compressibility or Carr Index (CI)**

Simple method to indirectly evaluate the flow properties of powders or formulations by comparing aerated density ( $\rho_a$ ) and packaged density ( $\rho_c$ ), with CI calculated by:  $CI = (\rho_c - \rho_a / \rho_c) \times 100$  (USP, 2006).



**Carr Index Values (%):**

- < 10% excellent flowability;
- 11 to 15% good flowability;
- 16 to 20% fair flowability;
- 21 to 31% poor flowability.
- 16 to 31% poor flowability (cohesive powders);
- > 32% very poor flowability.

**Table 1. Summary of IPT evaluations:**

Results of flow properties of combinations of nicarbazin + ionophore

	Aviax® Plus (Nicarbazin + Semduramicin)	Combination Nicarbazin + Ionophore
Physical Shape	Granular	Powder, vegetable carrier
Angle of repose (°) with SD*	31,0±1,8°	43,2±1,8°
Compressibility or Carr Index (%) with SD	4,3±0,1	11,4±0,4






\*SD – Standard deviation

Comparing the two combinations of nicarbazin + ionophores evaluated, it can be seen that the physical shape is important for the flow characteristics evaluated. The combination of nicarbazin + ionophore in granular form (Aviax® Plus) is superior to the association of nicarbazin + ionophore, whose presentation is in the form of a powder with a vegetable carrier.

When selecting an anticoccidial product it is important to select a safe product that has homogenous distribution in the premix and feed and minimizes the risk of carry over to sensitive species feed and withdrawal feed, which can lead to residues in the meat. As already illustrated in the data above, product form can play a crucial role in homogenous distribution, carryover risk and therefore, safety of the product.

In **Table 2** and in the figures are the physical presentations of some anticoccidial products available on the market. The presentations in granulated form favor mixing and reduce the risk of cross contamination, thus decreasing their adherence to the surfaces of equipment in the feed or premix plant.

**Table 2. Product Forms\***

	<b>Aviax® Plus Nicarbazin + Semduramicin</b>	<b>Nicarbazin + Narasin</b>	<b>Nicarbazin + Maduramycin</b>	<b>Nicarbazin + Monensin</b>	<b>Nicarbazin + Salinomycin</b>
<b>Supplier</b>	<b>Phibro Animal Health</b>	A	B	C	D
<b>Physical presentation</b>	Granular (2 molecules in the same granule)	Granular (granules separated for each molecule)	Powder with vegetable carrier	Granular	Granular powder  Nicarbazin powder and Salinomycin granular
					

\*Check with your local regulatory agency for available products in your country.



### **Aviax<sup>®</sup> Plus**

Granules contain both active ingredients (semduramicin and nicarbazin).



### **Nicarbazin + Salinomycin**

Nicarbazin powder and granulated salinomycin. Powder-like product..



### **Nicarbazin + Monensin**

Same granule with nicarbazin and monensin.



### **Nicarbazin + Narasin**

Yellow granules (nicarbazin) and dark granules (narasin).



### **Nicarbazin + Maduramicin**

nicarbazin + maduramicin powder mixed with vegetable carrier.

**Products in granular presentation are preferable to other physical presentations in terms of safety (less risk of poor homogeneity and overdose or cross-contamination) and provide better mixability for premix ration.**

