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DECOMPOSITION OF SUPPLEMENTARY VITAMIN C IN DIETS COMPOUNDED FOR LABORATORY ANIMALS

by

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SUMMARY

Processing may result in losses approaching 20% of the added vitamin C. The extent of these losses depends upon the process and is apparently related to temperature and moisture. Storage losses are also related to processing conditions, and no more than 50% of the vitamin C present in the diet immediately after processing may remain after 6 weeks. These results indicate that the current practice of including 1000 mg/kg of vitamin C in pelleted guinea-pig diets should be satisfactory, provided such diets are used within 6 weeks of manufacture and are stored during this period in conditions conducive to stability, that is dry, not exposed to direct sunlight and, preferably, with an even cool temperature.

When incorporated in a diet vitamin C is unstable, and decomposes when subjected to the various processes common to the production of cubed diets for laboratory animals.

Vitamin C was estimated (AOAC, 1970) in supplemented processed diets and in the related unsupplemented diets in meal form. Diet samples of about 5 kg initial weight were stored in multiwall paper sacks, stitched at the top, for periods up to 6 months, in storage conditions which were dry and not exposed to direct sunlight. The store was not heated and the temperature varied between 15-25°C depending on the season of the year. All samples were assayed at intervals throughout the storage period.

Assays on the unsupplemented diets indicated the presence of interfering substances giving assay results equivalent to 120 ± 30 mg/kg of vitamin C. Periodic assays during the storage period indicated that these interfering substances were considerably more stable than vitamin C itself. Assay results on supplemented diets have been corrected for this interference by subtracting the vitamin C equivalents found in the unsupplemented samples from the total vitamin C found in the related supplemented diets after the same period of storage.
In all 4 manufacturing processes have been investigated, and the first—the physical blending of ingredients in meal form—is necessarily a preliminary to the others. They are: pelleting with added cold water but without the use of steam; pelleting with the use of steam; extrusion with steam. Losses of vitamin C associated with these processes are given in Table 1.

Table 1. Processing losses of added vitamin C.

<table>
<thead>
<tr>
<th>Process</th>
<th>% loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meal blending</td>
<td>6.5</td>
</tr>
<tr>
<td>Meal blending and cold pelleting</td>
<td>13.0</td>
</tr>
<tr>
<td>Meal blending and steam pelleting</td>
<td>17.5</td>
</tr>
<tr>
<td>Meal blending and steam extrusion</td>
<td>12.0</td>
</tr>
</tbody>
</table>

The rate of loss of added vitamin C on storage varies with time, the rate being very high immediately after manufacture and slowing down considerably over the succeeding weeks. Fig. 1 illustrates the pattern of decomposition, 100% represents the corrected amount of vitamin C found in the diet at the start of the storage period. Most samples were assayed at weekly intervals for the first 10 weeks of storage; after this, the frequency of assay reduced to fortnightly and then to about monthly intervals for a total of 25 weeks.

![Fig. 1. Decomposition of vitamin C during storage.](image-url)
In Fig. 1 the samples tested were:

A. 18 samples of unsupplemented diets in either meal or pellet form. These samples were related to the samples of supplemented diets tested in B, C, D and E. No differences were found in the stability of the interfering substances between meal or pellets and curve A represents the combined data from all unsupplemented diets tested;

B. 2 samples of supplemented diets in meal form. The level of supplementation was 1000 mg/kg of vitamin C;

C. 6 samples of supplemented (1000 mg/kg) diets in pellet form made by the cold pelleting process;

D. 5 samples of supplemented (1000 mg/kg) diets in pellet form made by the steam pelleting process;

E. 5 samples of supplemented (1500 mg/kg) diets in pellet form made by the steam extrusion process.

Each sample was assayed about 10 times during the storage period and the curves in Fig. 1 are drawn through the lines of best fit assessed from the total data available for each group of samples tested.

REFERENCE
