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The effect of tocopherol and other antioxidants in the feed upon the flavour of pork

By
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Several compounds of value in nutritives of men and animals are easily destroyed by oxidation in the air. Oxygen is present everywhere, also within plant and animal tissue. Oxygen is specially reactive to fat, and essentials of fat are therefore liable to deteriorate more than other components in the organic tissue. The attac by oxygen will begin at the point of fat synthesis in plants and animals, and it will last all the way from treatment of the raw material, the handeling of feedstuffs and feeding of animals. It will proceed through absorbtion and metabolism in the animal, the treatment of animal products and to the final step, reduction of animal products in man.

In principle, I think there is no question that the constant degradation of nutritients should be prevented, a degradation which take essential parts away from its utilization as such.

Control or limitation of oxidation in food and feed would mean a higher deposition of vitamin A, vitamin E, essential fatty acids and unsaturated fats. The increase in content of antioxydative compounds which inhibits the reaction of air oxygen with fat, may be a measure to do this, to prevent the elsewise uncontrolled oxidation. Whether it is the correct or the only practical alternative to various possible methods of inhibition of oxidation, will not be discussed here. However, the prices of the antioxidants do s not seem to be too prohibitive for their use. If we make a rough estimate the value of vitamin E, A and of polyunsaturated fat in each kg of feed is worth about 2 øre or a quart of a penny, and if we further say that the efficiency of an antioxidant, which cost less than 0.5 øre pr. kg, is about 25 % it seems likely that the addition will give the money back.

The antioxidant that we should like to use is vitamin E.

Its general use as an oxidation inhibitor is, however, not economical. A few synthetic type antioxidants seem to fulfil the requirement as far as they are relatively low priced and have a good efficiency in protecting feedstuffs.

We have in this country tested BHT (butylated-hydroxy-toluene) and EMQ (ethoxy trimethyl dihydroguinaline) and shown that there is a difference in some feedstuffs where their addition have been tried (1). Karotene retention may be improved up to 70 % during the winter storage of grass meal. Various ground cereals when tested in the laboratory was found to be protected effectively. Herring meal, which is subject to rapid oxidation, was also quite effectively conservated with respect to fat oxidation in this way.

This was tested at laboratory level as well as in pilotplants and various factories for herring meal. At this point of investigation the question of antioxidants effect upon animal products was raised. The very effect of antioxidants in protecting the fat might also have an effect upon the quality of the pork. This possibility was proposed from members of our staff to happen when antioxidants where used. The antioxidants when increasing the fat content in the feed, would increase the intake and deposit of unsaturated fat in the animal. This might soften the pork fat and reduce the keeping properties. If it is herring fat that have been protected in this way, one might also expect an higher incidence of off taste score due to caracteristic feed fat. And these suggested results were actually what we could demonstrate when pigs were given herring meal stabilized with an antioxidant (BHT).

Since herring meal is usually fed on a low level for bacon pigs, below an average of 5 % or about 100 gram daily, and the fat content of the norwegian herring meal is very low, about 6 %, this effect of an antioxidant might in practice not mean much to the general pork quality.

The experiments indicated that when 15 g herring meal fat had been consumed, by doubling the herring meal level and raising fat level by means of BHT, the taste and stability of the bacon was reduced significantly. The addition

of antioxidants to herring meal is not permitted in this country, although a general control of fat content in meal may give a sufficient garanti against any adverse effects.

The antioxidant which was left in the meal apparently was not sufficient to stabilize the pork carcass. When vitamin E was given in the same experiment, the addition significantly improved the oxidative stability of the pork fat and tended also to improve taste scores (2). In further work we have shown that vitamin E as well as an excess or supplemental addition of BHT or EMQ stabilizes pork fat. It thus seems desirable that if the fat of one unsaturated compound of feed is stabilized additional protection either by means of tocopherol or excess antioxidant should be given. When unsaturated fat in animal depots have been raised, also antioxidant protection must be increased in order to keep the oxidative stability of depot fat.

In feeding of oats to bacon pigs, also a high level of unsaturated fat was laid down, and the level was further elevated when the ground oats were stabilized by an antioxidant (EMQ) (3).

This experiment was somewhat different from the experiment with herring meal.

The use of antioxydant improved the stability of pork in oat feeding in spite of higher unsaturated fat level by use of antioxydant. In this case was the level of antioxidant in feed sufficient to improve carcass stability. Although "oat-taste" seemed to be recognized by the tasters in this case, the scores were not high enough to indicate any effect of antioxidant upon taste. The use of the synthetic antioxidants as improver of taste as vitamin E tended to be, has thus not yet been demonstrated.

Summary

Antioxidants added to the feedstuffs tend to protect and improve deposition of unsaturated fat andfat vitamins.

The unsaturated fat, as demonstrated in experiments with herring meal, will affect the stability and flavour of the pork.

If antioxidants are present in excess, or when additional vitamin E is given, the stability of the carcass is improved. Vitamin E also tended to improve the flavour score.

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(1) Astrup, H.N. (1963): Forsøk med antioksydanter i fôrmidler. Tidsskr. f.d. Norske Landbruk 70, 101-111.

(2) Hvidsten, H., Astrup, H.N. and Aure, L. (1965): Fôringsforsøk med sildemel tilsatt di-tert-bytyl-p-hydroksy-toluen (BHT) og med rasjoner med og uten E-vitamin til slaktegriser. Fiskeridir. Skr. Tekn. Und. Vol. IV, No. 9.

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