Lecithin and BHT act as synergistics antioxidants in feed

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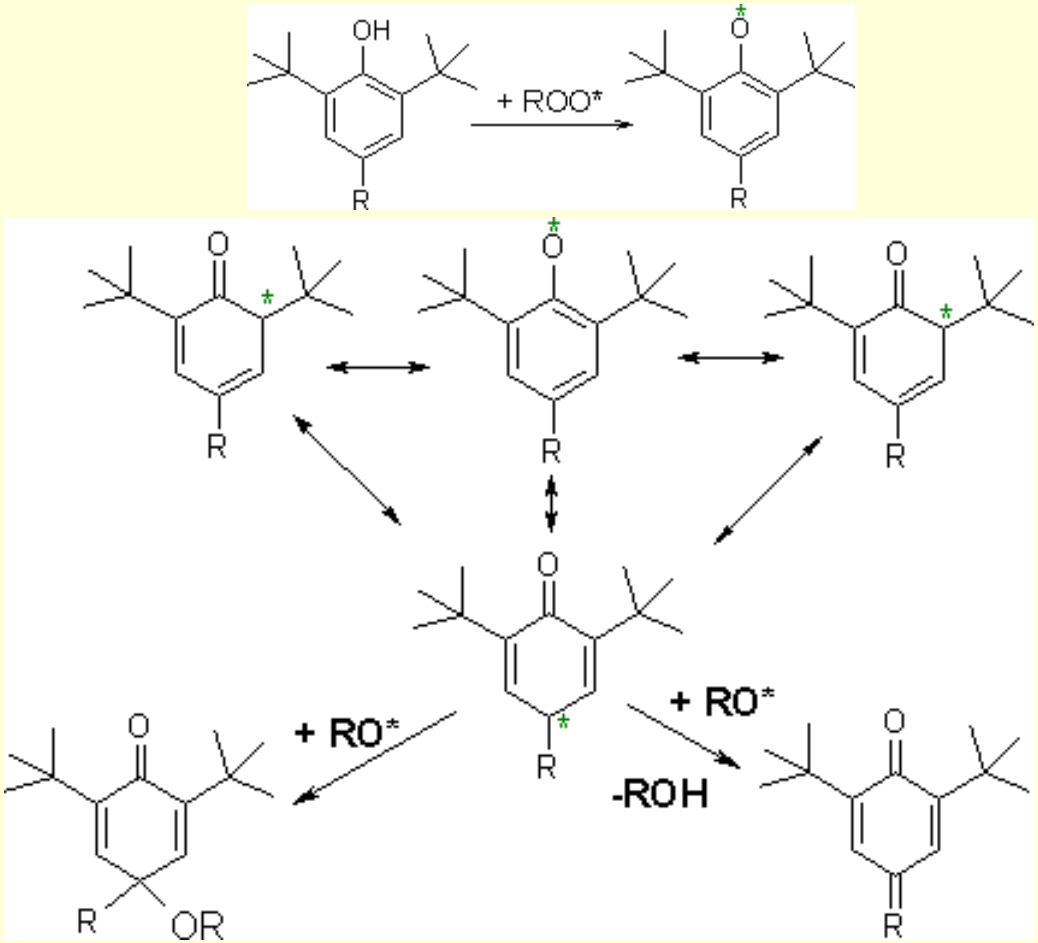
Antioxidants

- **Direct antioxidants**
  - redox active
  - short-lived
  - sacrificed
- **Indirect antioxidants**
  - may or may not be redox active
  - may chelate oxidative cations as Fe^{2+} and Cu^{2+}

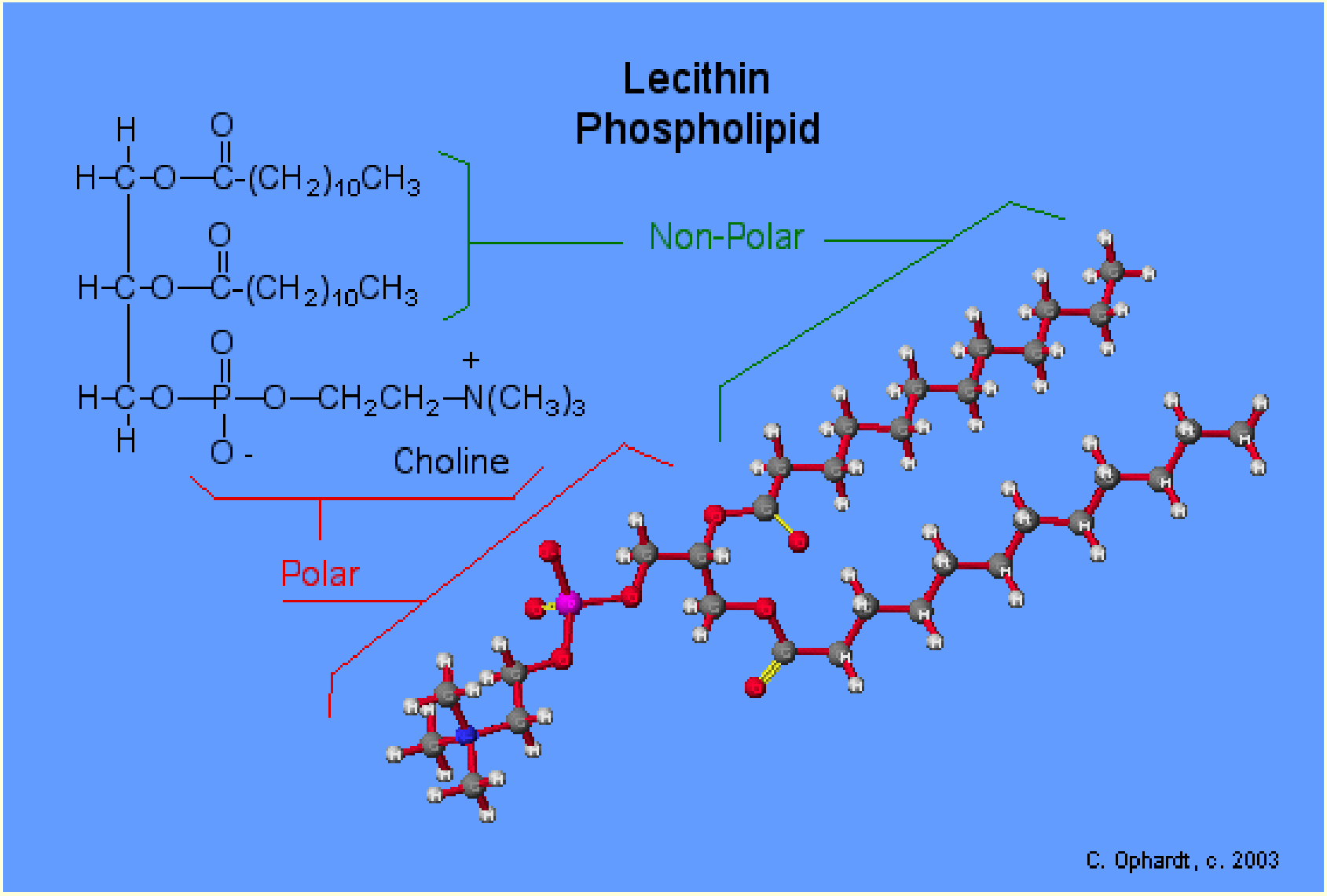
BHT – Butylated hydroxy toluene

ROO* radicals are deactivated by hindered phenol via the following reaction.



The phenoxy radical generated are very stable

Phospholipids



Hypothesis

- Combinations of primary antioxidants (BHT) and indirect antioxidants (chelating agents as phospholipids) wil provide a better oxidative stability of a feed mix containing high amounts of unsaturated fatty acids and prooxidants as Fe^{2+} and Cu^{2+}!

- Evaluation of oxidative stability:

  Quantitative analysis of free tocopherols by HPLC.

  (α- and γ-Tocopherol were added to the feed with 100-200 mg/kg feed)

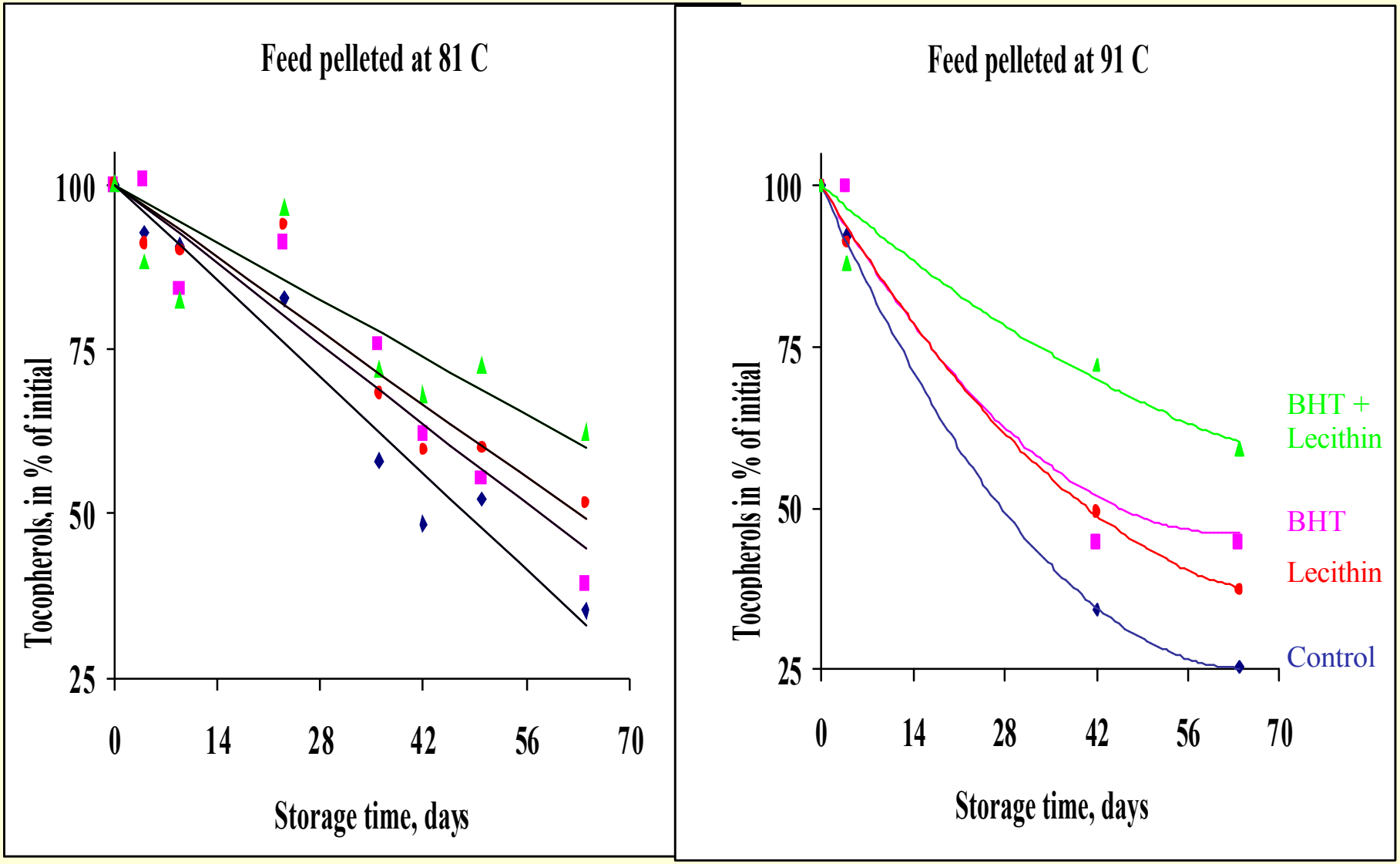
Experimental setup (1)

- Starter pig feed composed of protein concentrate, wheat, fish meal, canola oil + mineral vitamin mixture
  - Were added

1) 60 ppm BHT
2) 3.5% lecithin (on the expense of canola oil)
3) 60 ppm BHT + 3.5% lecithin

  - Mixed and pelleted at either 81 C or 91 C and stored for 64 days at 15-20 C

Experiment 1



Effect of antioxidants and pelleting temperature on tocopherols exp. 1

Storage time, days $Y = aX + b$			
81 C	15	30	60
Control	84	69	37
BHT	87	74	48
Lec	88	76	52
Lec + BHT	91	81	62

Storage time, days $Y = aX^2 + bX + c$			
91 C	15	30	60
Control	69	47	26
BHT	74	56	43
Lec	77	59	39
Lec + BHT	88	77	61

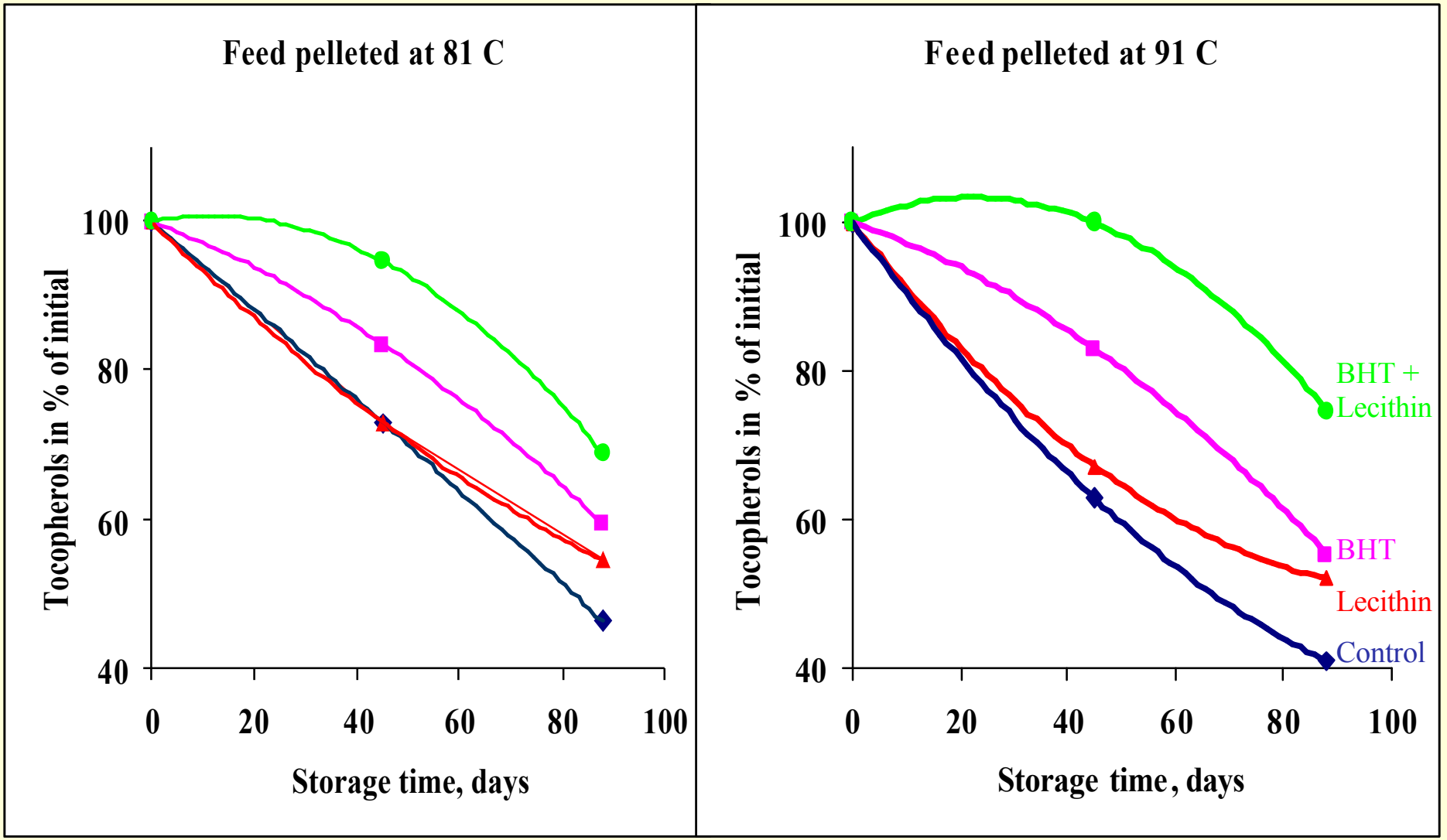
Experimental setup (2)

- Starter pig feed composed of protein concentrate, wheat, fish meal, palm oil/canola oil + mineral vitamin mixture
  - Were added

1) 100 ppm BHT
2) 1.1% lecithin (on the expense of canola oil)
3) 100 ppm BHT + 1.1% lecithin

  - Mixed and pelleted at either 81 C or 91 C and stored for 88 days at 15-20 C

Experiment 2



Effect of antioxidants and pelleting temperature on tocopherols exp. 2

Storage time, days $Y = aX^2 + bX + c$			
81 C	0	45	88
Control	100	73	46
BHT	100	84	59
Lec	100	73	55
Lec + BHT	100	95	69

Storage time, days $Y = aX^2 + bX + c$			
91 C	0	45	88
Control	100	63	41
BHT	100	83	55
Lec	100	67	52
Lec + BHT	100	101	75

Conclusions

- The content of tocopherols decrease with increasing storage time irrespective of the type of antioxidants
- Pelleting at 91 C cause greater reduction in tocopherol content than pelleting at 81 C.
- Lecithin and BHT acts as synergistics antioxidants