

The Low-Boiling Volatiles of Cooked Foods

By R. Self, J. C. Casey and T. Swain

Low Temperature Research Station, Downing Street, Cambridge

Using capillary column gas chromatography¹ in the relative quantities present. This suggests that 13 low-boiling compounds (b.p. < 120°C.) were identified² in the volatile fraction from boiling potatoes. These include, besides methanol and acetone, six aldehydes, three sulphides and two thiols. (See Table.)

After the usual boiling time of 20-30 minutes only seven of these volatiles were detected, the other six appearing after boiling for several hours (*cf.* potato samples *a* and *b* in Table). When the volatiles obtained after 30 minutes boiling from a number of other foods were examined it was found that all of them contained at least six of the 13 components present in the potato (Table). In addition several contained *n*-propane-thiol³ which was not found in the potato. It appears probable from this brief survey, and from other work⁴⁻⁷ that most cooked foods will produce a similar pattern of low-boiling volatiles varying only

these common volatiles are produced by degradation of metabolites which are normally present in all biological material. Indeed some of the volatile components identified in the Table have been shown to be produced from amino-acids in model systems.⁸⁻¹⁰

Studies made in this laboratory¹¹ have shown that the volatiles produced from amino-acids are dependent on other compounds present in the system, and this could explain, to some extent at least, differences in the relative quantity of a given volatile produced from cooked foods which apparently contain similar amounts of the corresponding amino-acid. In addition there are a great many other experimental factors which can affect the quantitative measurement of volatiles produced from a particular food, and unless comparisons are made under identical conditions misleading results may be obtained.

Table
A Survey of the Low Boiling Volatiles from Cooked Foods
Produced After Boiling for 30 Minutes

Food	Volatiles											
	1	2	3	4	5	6	7	8	9	10	11	12
Brussels Sprouts	L	S	VL	(S)	S	VL	S	O	O	O	O	VL
Beans (French, Frozen) ..	S	S	S	(S)	O	M	O	Tr	Tr	Tr	Tr	—
Beef (Rump Steak)	L	S	Tr	(S)	(M)	O	O	O	Tr	O	O	—
Carrot	O	L	S	(S)	Tr	L	Tr	O	O	O	O	M
Cauliflower (Inflorescence) ..	L	S	VL	(S)	S	VL	Tr	S	O	O	O	—
Celery	Tr	S	O	(Tr)	O	VL	O	O	O	O	O	VL
Coconut	L	L	S	(L)	(L)	S	S	O	O	O	O	—
Coffee (Instant Powder)	O	L	Tr	(M)	(S)	S	O	O	S	O	S	O
Corn (Sweet, Frozen)	L	L	S	(S)	S	L	O	O	O	O	O	S
Leek	L	S/L	L	(L)	(L)	O	VL	O	VL	O	O	—
Lettuce	S	L	S	S	S	L	S	O	S	O	S	—
Onion	L	S	L	(VL and M)	O	VL	O	VL	O	O	O	L
Parsnip	S	L	S	Tr	S	Tr	VL	O	O	O	O	VL
Peas (Frozen)	L	S	S	O	Tr	M	O	Tr/S	O	O	Tr	S
Potato (a) 30 mins.	M	S	S	(S)	Tr	M	O	O	O	O	O	L
Potato (b) 5 hours	VL	VL	L	(VL)	M	S/L	M	O	M	M	M	VL
Swede	M	L	L	(S)	O	VL	O	O	O	O	O	VL
Tea (Black)	S	M	Tr	(M)	(L)	S	S	S	S	S	S	—

Compound: 1 — Hydrogen sulphide; 2 — Acetaldehyde; 3 — Methanethiol; 4 — Propionaldehyde; 5 — Acetone; 6 — Ethane-thiol; 7 — Dimethyl sulphide; 8 — 2-Methylpropanal; 9 — n-Propanethiol; 10 — 3-Methylbutanal; 11 — 2-Methylbutanal; 12 — Methanol; 13 — Dimethyl disulphide is present only after more than 0.5 hr. boiling; 14 — Acrolein detected in trace amounts in potato²

Except for methanol, in order of retention time from 50' silicone oil on nylon capillary at 25°C. Methanol was detected using a 36' polyethylene glycol-200 on stainless steel capillary at 40°C.

Tr = Trace; O = Undetectable; S = Small; M = Medium; L = Large; VL = Very Large — = Not estimated.

Bracketed values indicate incomplete separation

Although the high boiling volatile components of cooked foods must play a part in their overall flavour, the low-boiling volatiles obviously have an important role. It may be that the differences in flavour among certain foods, lie not in the presence of one or more unique components, but in the relative quantitative pattern of these low-boiling substances.

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