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Nutritional quality, bioactive compounds, and antioxidant activity of nine clones of fresh garlic and its black garlic derivative: a comparative study

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INTRODUCTION & AIM

Fresh garlic (*Allium sativum* L.) is one of the main bulbs cultivated and consumed worldwide as traditional medicinal plants or functional foods. However, a critical drawback of fresh garlic is its strong odour and pungent taste. Thus, black garlic, an aged processed product, has gained importance as an alternative due to the fact that it possesses a sweet taste and less pungent odor compared with fresh garlic.

This work focused on the evaluation and comparison of the nutritional quality, bioactive compounds (total and individual phenolic compounds), antioxidant activity (by means of the DPPH method), and the correlation among these traits in nine clones of fresh garlic and its aged product, black garlic.

Keywords: *Allium sativum* L., functional food, biological properties

METHODS

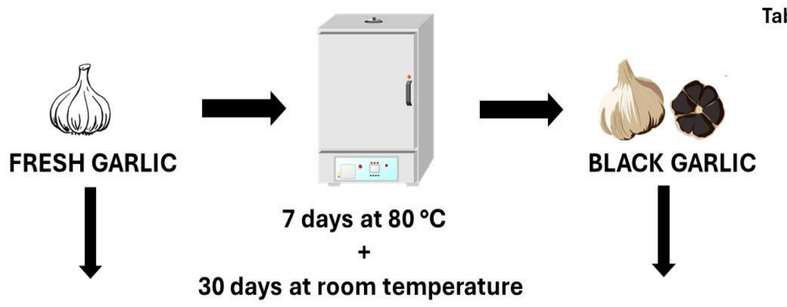

Table 1. Argentine classification of garlic cultivars

Ecophysiological groups	Cultivars
White type	Perla INTA
	Aylín INTA
	Nieve INTA
Red type	Gran Fuego INTA
	Rubí INTA
Purple type	Morado INTA
	Killa INTA
Elephant type	Gigante INTA
Chestnut type	Castaño INTA

CHEMICAL ANALISYS

- Proximate composition: official analysis methods of the AOAC.
- Pungency, total phenolic compounds and antioxidant activity : spectrophotometry methods[1].
- Individual quantification of phenolic compounds: UHPLC analysis[2].

RESULTS & DISCUSSION

Nutritional composition

The results denoted that the moisture content material of black garlic was reduced, while crude protein, crude fiber, crude ash, and carbohydrate contents were considerably improved (Table 2).

Table 2. The proximate composition of fresh and black garlic cultivars.

Cultivar	Type	Nutritional composition g per 100 g					
		Water	Ash	Protein	Fat	Crude fiber	Carbohidrates
Nieve INTA	FG	67	1,4	4,1	< 0,1	1,5	26,4
	BG	53	2	8	< 0,1	1,4	36
Perla INTA	FG	68	1,4	5,2	< 0,1	1	24,8
	BG	52	2	6	< 0,1	3,4	38
Aylín INTA	FG	64	1,2	4,5	< 0,1	0,7	29,3
	BG	51	2	8	< 0,1	1,3	38
Morado INTA	FG	67	1,5	5,6	< 0,1	0,7	25
	BG	47	2	9	< 0,1	2,3	38
Killa INTA	FG	68	1,5	4,6	< 0,1	0,8	24,9
	BG	59	2	6	< 0,1	1,1	32
Gran Fuego	FG	61	1,3	5,3	< 0,1	0,8	32
	BG	39	2	10	< 0,1	2,3	46
Rubí INTA	FG	64	1,3	6	< 0,1	0,6	27,6
	BG	49	2	8	< 0,1	1,4	40
Castaño INTA	FG	60	1,2	6,3	< 0,1	0,9	31,7
	BG	35	2	10	< 0,1	1,5	51
Gigante INTA	FG	65	1,2	4,5	< 0,1	0,8	28,1
	BG	41	2	6	< 0,1	3	49

FG: fresh garlic. BG: black garlic

Antioxidant activity

Black garlic showed four to nine times more antioxidant activity than fresh garlic (Figure 2).

The antioxidant activity was correlated with polyphenols content and pungency levels (Table 3).

Table 3. Pearson correlation coefficient (r) between total phenolics content, pungency and antioxidant activity.

	Pungency	TPC	DPPH (%Inh.)
Pungency	-	-0.66	-0.59
TPC	-0.66	-	0.97
DPPH (%Inh.)	-0.59	0.97	-

Pungency and total phenolic content

In addition, it was found that black garlic presented a higher total phenolic content (1028.84-1727.95 mg/100 g dw) than fresh garlic (228.49-403.65 mg/100 g dw), Figure 1. Hydroxycinnamic acid derivates were found to be the main phenolic acids in both fresh and black garlic.

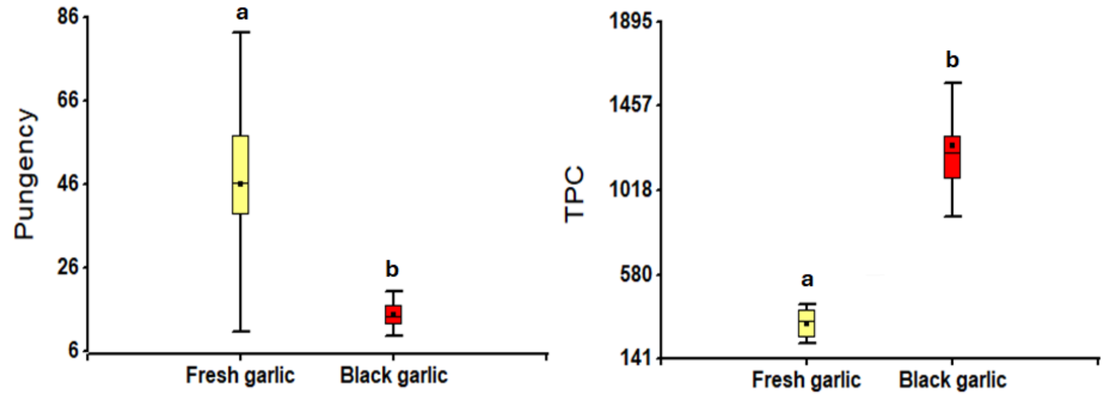

Figure 1. Comparative boxplot of total phenolic content (TPC, mg%g fw) and pungency levels (µmol g^{-1} fw) of fresh and black garlic Different superscript letters indicate a significant difference ($p < 0.05$).

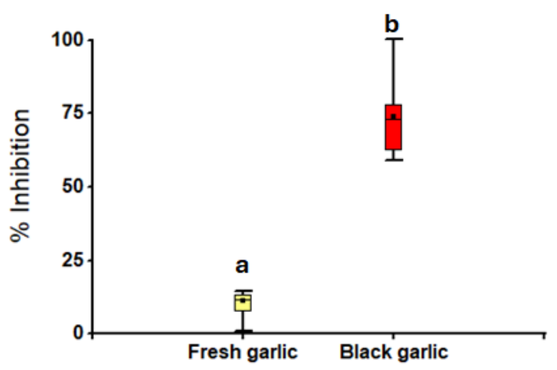

Figure 2. Comparative boxplot of DPPH scavening activity of fresh and black garlic Different superscript letters indicate a significant difference ($p < 0.05$).

CONCLUSION

These findings highlight a need for a careful consideration of garlic clones in both dietary and therapeutic contexts.

References

1. Soto, González, Sance, Galmarini. *Acta Horticulturae ISHS*, 2016, 1143.39: 277.
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