

FACTORS INFLUENCING BIOGENIC AMINE CONTENT OF EUROPEAN RIPENED CHEESES

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INTRODUCTION

Several factors may influence the levels of biogenic amines (BAs) produced in cheese, including the presence of microorganisms possessing amino acid decarboxylating activity, the availability of free amino acids, pasteurization of milk, and ripening time and its conditions – temperature, pH, and NaCl concentration (Linares et al. 2012). Commonly detected BAs in cheese include histamine (HIS), tyramine (TYR), putrescine (PUT), cadaverine (CAD) (Benkerroum, 2016). While BAs may affect the quality of the food itself, the main concern with BAs in foods is their known physiologic and toxic properties – and hence their potential health hazard – if consumed in high enough concentrations. Foods containing low levels of BAs are normally not considered a health concern because the human gut will metabolize exogenous BAs by means of detoxifying enzymes: monoamine oxidase (MAO), diamine oxidase (DAO), and polyamine oxidase (PAO). If this protective mechanism is overwhelmed by excessive intake of BAs or by other means, it may lead to the accumulation of BAs within the body causing toxicological effects. (Ruiz-Capillas & Herrero, 2019). In addition, one must take into consideration any additive and possibly synergistic effects, making the total level of BAs consumed more important than the level of any one single amine from a single source (Del Rio et al., 2017). Due to the number of factors that can affect the toxicity of BAs, toxicity levels are difficult to establish. Based on a limited number of studies, a no-observed-adverse-effect level (NOAEL) was set for histamine at 50 mg per meal for healthy individuals (EFSA, 2011). Famous European medium- and long-ripened cheese types have been evaluated based on the available research data.

1 2 3 BIOGENIC AMINE CONTENT (mg/kg) of SHORT-RIPENED (60 days) EUROPEAN CHEESES														
MILK TYPE	RAW MILK							THERMIZED or PASTEURIZED MILK						
	HIS	TRY	PUT	CAD	TOTAL	CHEESE TYPE	REF	HIS	TRY	PUT	CAD	TOTAL	CHEESE TYPE	REF
COW	28	38	19	32	299	Montasio PDO	Innocente	587	282	n.d.	1	1327	Toma Piemontese	Innocente 2002
SHEEP	n.d.	52	23	104	208	Farmhouse Pecorino	Manca 2015	21	66	6	36	206	Pecorino Sardo	Manca, 2015
GOAT	28	245	74	178	n.d.	Spanish goat	Novella 2003	4	7	8	16	n.d.	Spanish goat	Novella 2004

1 2 3 BIOGENIC AMINE CONTENT (mg/kg) of LONG-RIPENED (360 days) EUROPEAN CHEESES														
MILK TYPE	RAW MILK							THERMIZED or PASTEURIZED* MILK						
	HIS	TRY	PUT	CAD	TOTAL	CHEESE TYPE	REF	HIS	TRY	PUT	CAD	TOTAL	CHEESE TYPE	REF
COW	397	26	2	8	448	Voralberger	Mayer, 2010	186	93	5	35	420	Appenzeller >180 days	Wechsler 2013
SHEEP	167	188	194	334	1027	Farmhouse Pecorino	Manca, 2015	53	163	8	26	279	Pecorino Sardo	Manca, 2015
GOAT	43	325	86	196	n.d.	Spanish goat 90 d.	Novella 2004	6	11	15	33	n.d.	* Spanish goat 90 d.	Novella 2004

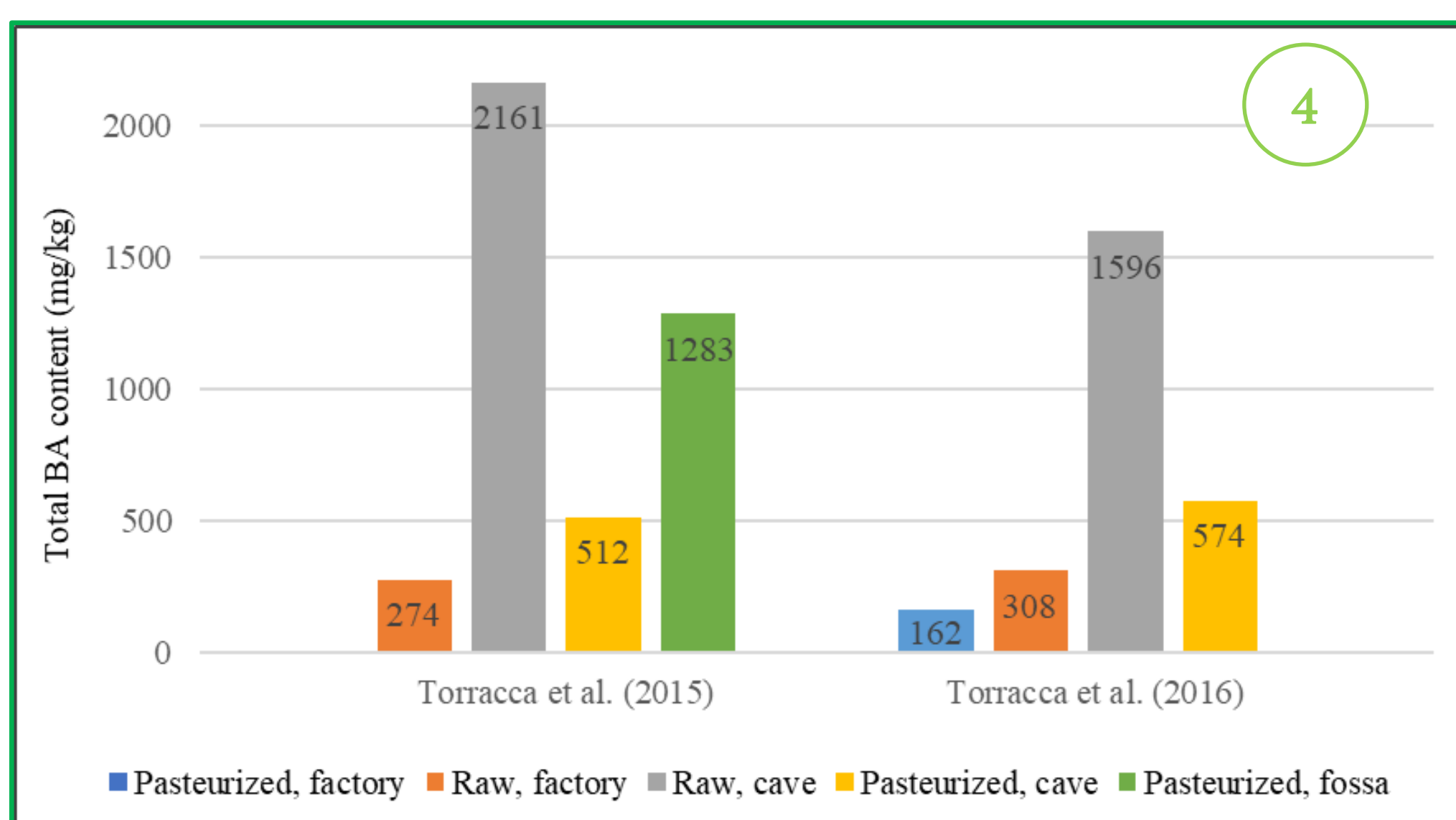
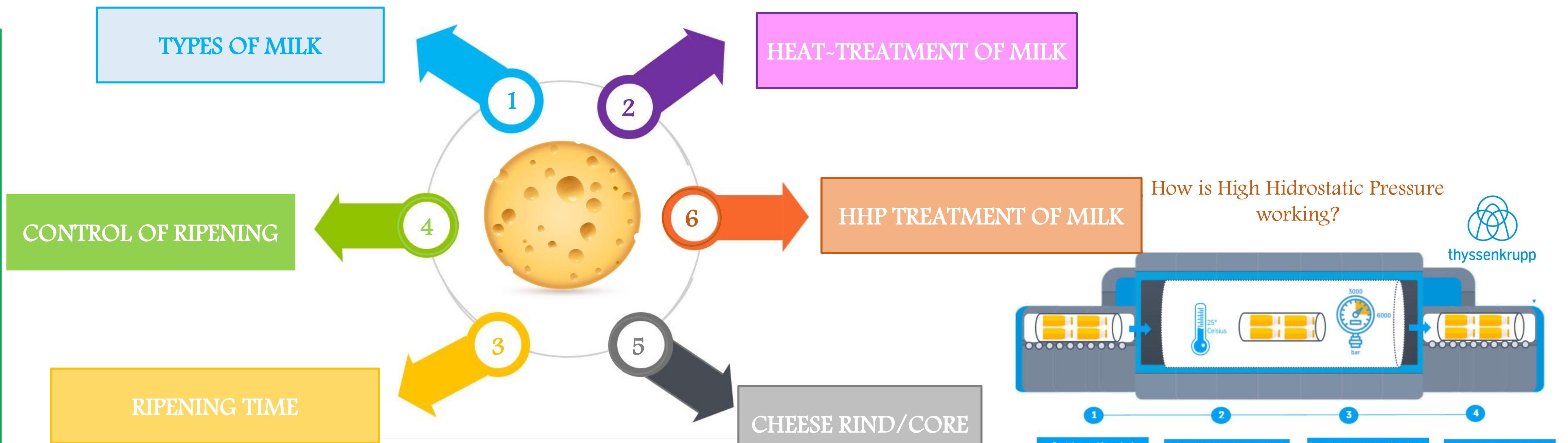
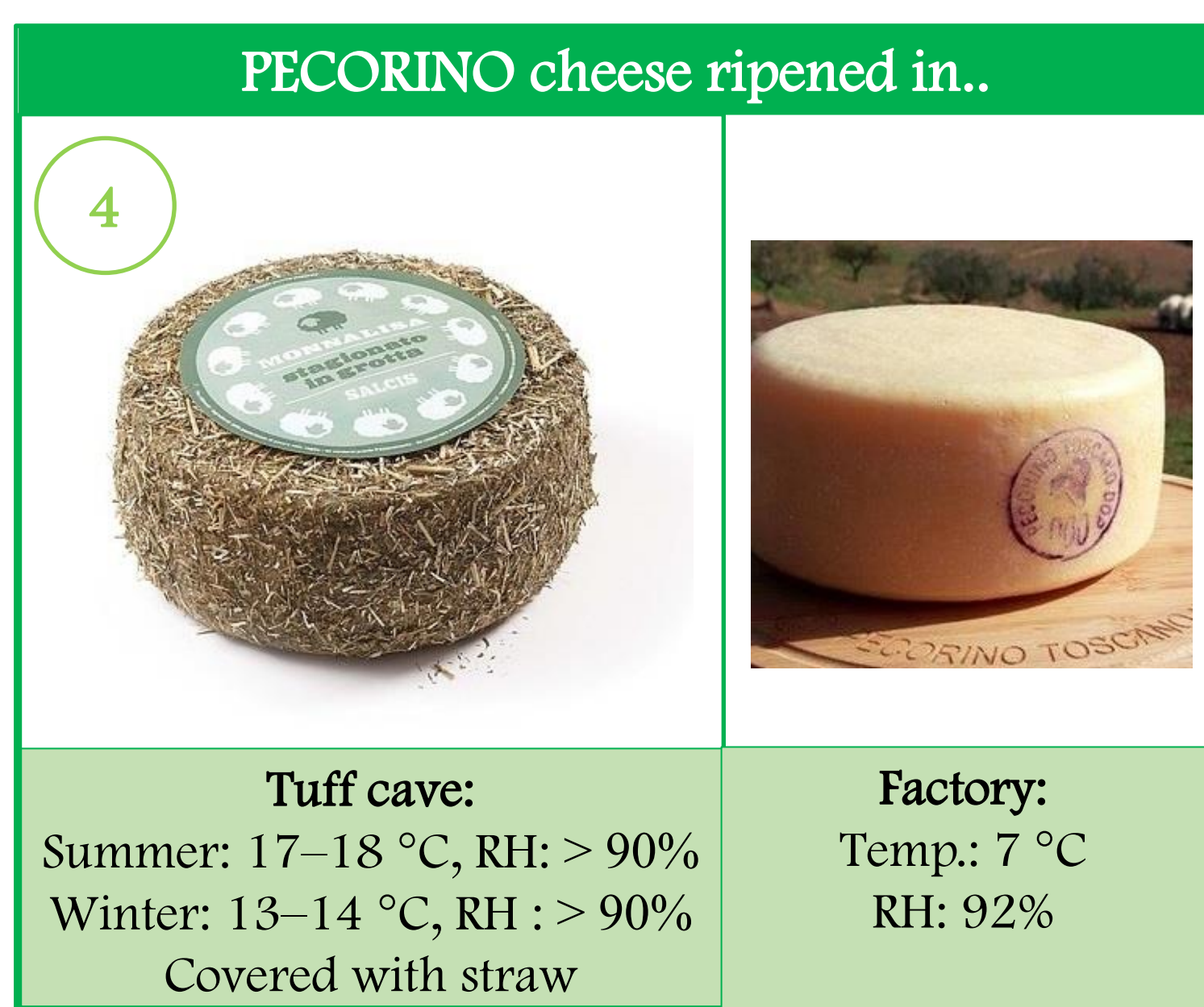


Figure 1 Mean total BA content (in mg/kg) in pasteurized and raw milk for Pecorino cheeses ripened under different conditions

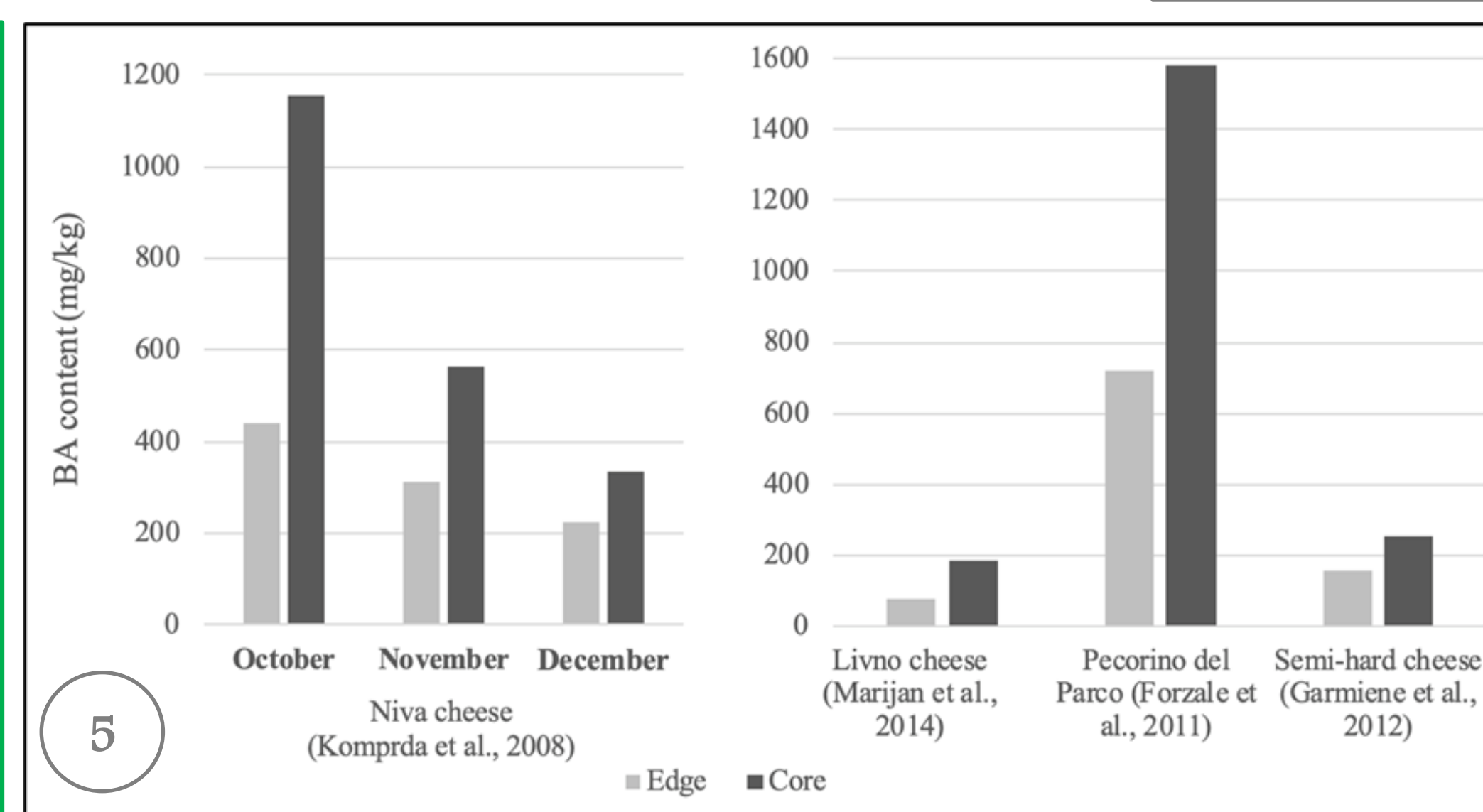


Figure 2 Comparison of BA concentrations in edge/rind and core of Niva, Livno, Pecorino del Parco and a semi-hard cheese at the end of ripening (in mg/kg)

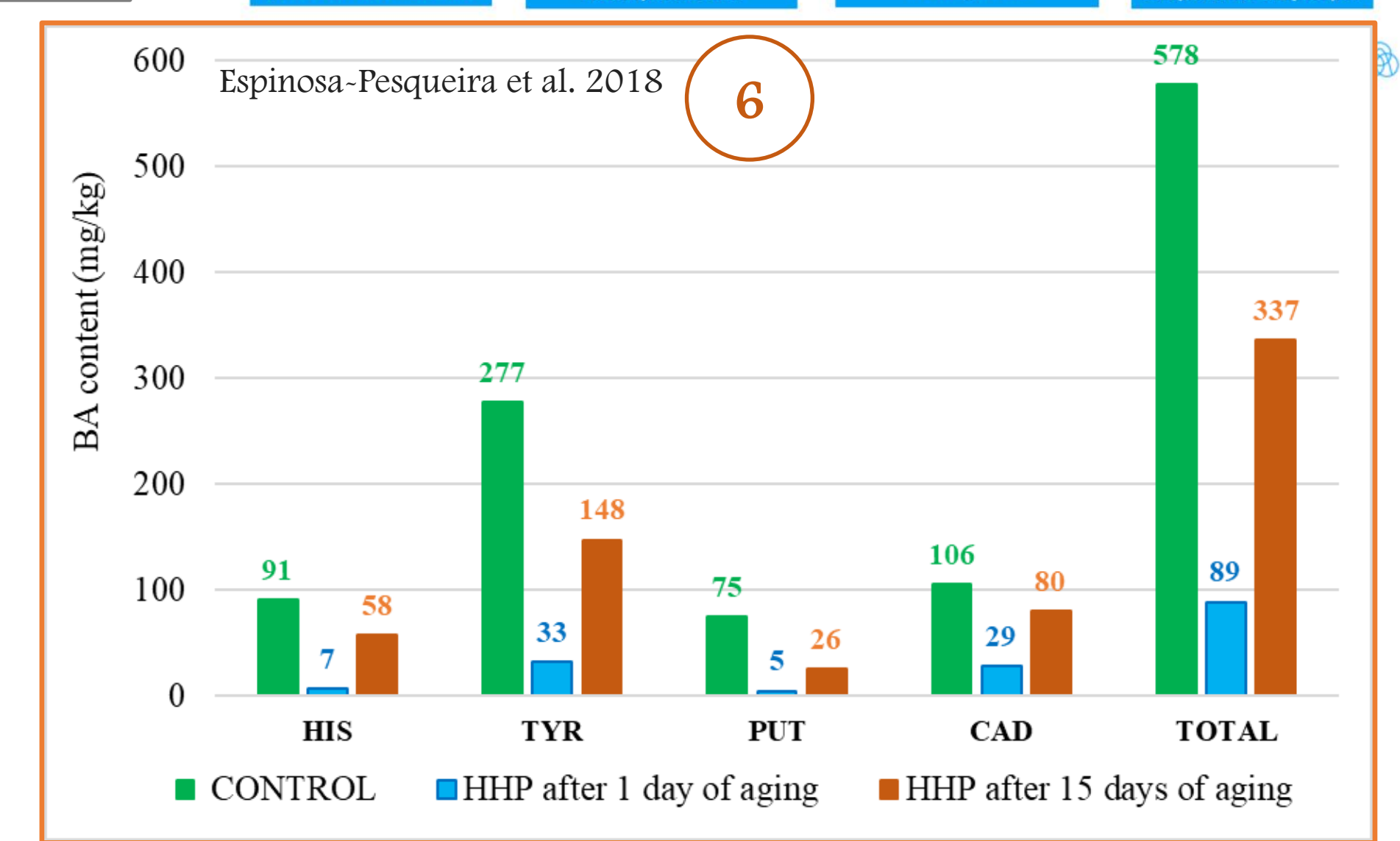


Figure 3 Comparison of BA concentrations based on timing of HHP treatment (400 MPa, 10 min) of raw sheep's milk (in mg/kg)

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