

Product	Constituents	Legislation	Subject to allergen labelling?	Price	Cost to treat 100kg prawns	Dilution	Product treated with 50L dip tank	Performance	Suppliers
Sodium metabisulphite	E223	Permitted food additive in UK. Annex III Part B Directive 95/2/EC	Yes	£12.93 for 25kg (52p per kg)	52p	5%	200kg	Prevention of blackspot to seven days. Visually some bleaching effect. Taste often tainted.	Various
Hasenosa HA-5502 Freskor (Spanish)	Sodium metabisulphite (E223) Citric acid (E330) Ascorbic acid (E300) EDTA acid (E385) Sodium bicarbonate (E500ii)	Permitted in UK Directive 95/2/EC	Yes	£29 for 25kg bag (£1.16 per kg)	£2.32	2%	50kg	Good visual qualities to eight days. Effective melanosis control.	Scotprime Seafood Ltd 11 Whitfield Drive, Heathfield Ind Est, Ayr, Strathclyde. KA8 9RX Tel: 01292 611942
Pluscolor Fish 3425	Sodium metabisulphite (E223) Citric acid (E330) Sacarose (E451(i)) Sodium ascorbate (E301)	Permitted in UK Directive 95/2/EC	Yes	£1.20 per kg	£1.60	1.3%	50kg	Good, bright appearance. Blackspot prevention to eight days. Effective treatment.	Peterhead Net Company 7 Wilson Street, Peterhead. Tel: (01779) 821830 or 07802 510225
Melacide SC-20	Sodium hydrogen sulphite (E222) Sodium ascorbate (E301) Potassium citrate (E332) Citric acid (E330)	Permitted in UK Directive 95/2/EC	Yes	£1.75 per kg	73p	3%	250kg	Good visual qualities to eight days. Effective melanosis control.	Malahide Filter Services Peterhead. Tel: 01779 480908 Norkem, Knutsford, Cheshire. Tel: 01565 755550
Xyrex Prawnfresh	Inorganic stabilising buffers, organic acids.	Processing aid as defined by Directive 89/107/EEC	No	0.5L @ £30. 5L @ £250	£2.50-£3	1:1000	100kg	Good blackspot prevention and best eating qualities. Max. blackspot prevention to nine days.	Xyrex Willowyard Ind Est, Beith, Ayrshire, KA15 1LN. Tel: 0870 1610103
Everfresh	4-Hexylresorcinol (E586) Sodium chloride	Included in amendments package for Directive 95/2/EC. Expected formal adoption early 2006	No	\$6 USD (£3.45) per 200g pouch	£1.38	200g:125L	100kg	Overall performance good - comparable to sulphite based treatments.	SunOpta Food Ingredients 25 Wiggins Ave, Bedford, MA. 01730 USA Tel. 781 276 5176
Aquabon SD / 14W	Citrus bioflavonoids Citric acid (E330) Ascorbic acid (E300) Glycerine (USP)	GRAS additives listed in Annex II of Directive 95/2/EC	No			2%		Some blackspot prevention to five days. Good flavour.	Scotmas Limited Spylaw Road, Kelso TD5 8DL. Tel: 01387 880779
Soft acid Aqua E	Organic + lignosulphonic acids		Yes	1/3L : 100L water (0.3% trialled)				No control of blackspot.	Borregaard LignoTech Norway. Tel: +47 69118000
Citric acid	E330	Permitted in UK Directive 95/2/EC	No	£163 for 25kg		3%		Poor prevention of blackspot. Performance worse than no treatment.	Trial samples from Plater chemicals, UK.
Ascorbic acid	E300	Permitted in UK Directive 95/2/EC	No	£273 for 25kg		1%			

Further information

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PROJECT PART-FINANCED
BY THE EUROPEAN UNION
THROUGH THE FINANCIAL
INSTRUMENTS FOR
FISHERIES GUIDANCE

Introduction

Sodium metabisulphite has been used by the UK fishing industry for many years to control the effects of melanotic blackening in prawns (*Nephrops norvegicus*). Melanosis is the formation of dark pigmentation in the skin or outer tissue. Following recent court cases relating to high levels of sulphite residue and the requirement for allergen labelling, there is now interest to secure alternative treatments or processes to control melanosis. Further motivation comes from the highly corrosive nature of sodium metabisulphite, which causes extensive damage to vessels and processing equipment and has serious operational health and safety issues. This document summarises trials undertaken by Seafish and partner processors to investigate viable alternatives to sodium metabisulphite.

Legislation

Sodium metabisulphite (E223) is currently listed as an authorised food additive with maximum permitted residues in crustacean products of 150 parts per million (ppm). Sodium metabisulphite is regarded as one cause of asthma attacks and can trigger allergic reactions in vulnerable people. In accordance with this, EU Directive 2003/89/EC has made allergen labelling a requirement for all metabisulphite treated food stuffs. This directive came into force on 25 November 2005 and is implemented by The Food Labelling Regulations 2004, with parallel legislation in Scotland, Wales and Northern Ireland.

Allergen labelling regulations require that treatment with metabisulphite is clearly displayed on the final product. The effect of this may promote retailers to source alternative, non sulphite treated prawns and will increase consumer awareness of prawn treatments.

Contents of cod end in a hopper



Blackspot formation



Sea trials

Nine chemical treatments were selected for trial and were tested alongside sodium metabisulphite and a control (no treatment). All trials were conducted aboard trawlers in north east Scotland. Prawns were dipped at sea and stored on ice for the duration of the trial. All treatments were used in accordance with the manufacturers' guidelines. Sodium metabisulphite was trialled at 2.5% (3 min dip time) and 5% (10 min dip time). Once onshore all samples were assessed by local processors who undertook checks for appearance, odour, texture and taste over shelf life. Samples were also analysed for sulphite residue and microbial content.



technology implementation Key Features

Sodium metabisulphite alternatives



Treatments and results

Shelflife

Results confirm that untreated prawns show initial signs of blackening within just two to three days and reach an unacceptable quality after six days. Current treatment with sodium metabisulphite inhibits blackening for between five and seven days and retains an acceptable appearance for up to 13 days at high concentrations.

Treatment	Days on ice										
	5	6	7	8	9	10	11	12	13	14	
Ascorbic acid	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black
Citric acid	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black
Soft acid	Yellow	Yellow	Black	Black	Black	Black	Black	Black	Black	Black	Black
Control	Yellow	Yellow	Black	Black	Black	Black	Black	Black	Black	Black	Black
Meta 2.5%	Green	Green	Green	Green	Yellow						
Aquabon	Green	Green	Green	Green	Yellow						
Meta 5%	Green	Green	Green	Green	Yellow						
Melacide	Green	Green	Green	Green	Yellow						
Everfresh	Green	Green	Green	Green	Yellow						
Hasenosa	Green	Green	Green	Green	Yellow						
Pluscolour	Green	Green	Green	Green	Yellow						
Xyrex Prawnfresh	Green	Green	Green	Green	Yellow						

Table showing effect of treatment on appearance.

Black	Blackening on all prawns. Unacceptable quality
Yellow	Occasional / slight darkening of head
Green	Good, bright appearance

A number of treatments are competitive with sodium metabisulphite for maintaining the visual quality of prawns. Overall shelf life with these treatments is comparable to metabisulphite when this is applied at high concentrations (5%). However, prawns treated with 5% metabisulphite lose visual appearance through bleaching. This is not evident with alternative sulphite treatments, which benefit from the inclusion of chemicals which act to enhance natural shell colouration.

Two non-sulphite based chemicals were found to be effective at delaying melanotic blackening.

- Everfresh (active ingredient 4-hexylresorcinol) is not permitted for use on crustaceans in the UK although is expected to be formally adopted for this purpose in early 2006.
- Xyrex Prawnfresh appeared to be the most successful treatment for maintaining appearance. This treatment is classified as a 'processing aid' and does not require labelling as a food additive.

Samples kept on ice



Sulphite residues & micro analysis

- The laboratory results indicate that prawns treated with 5% sodium metabisulphite solution contained the highest sulphite residue, often above the maximum permitted level of 150 ppm. Prawns with high sulphite residue were found to have poor flavour. As a general rule of thumb it is true to say that sulphite residue decreases over time for all products.

Treatment	Sulphite residue (ppm)	
	min.	max.
Control	<10	
Melacide	<10	48
Pluscolour	<10	60
Meta 2.5%	37	61
Soft acid	<10	73
Hasenosa	48	96
Meta 5%	144	171

Minimum and maximum sulphite residues for all treatments. (Treatments not listed are non sulphite based. Residue was absent in all cases.)

- Micro analysis showed that all treatments recorded similar results to metabisulphite (5%). No irregular bacterial counts were experienced.



Implications for industry

No chemical treatment was found to prevent blackspot formation, which is an inevitable part of the spoiling process. At best this can be delayed through chemical dipping. It is critical that good handling practices and strict temperature control are maintained throughout the processing chain.

These trials have shown that alternatives to sodium metabisulphite are effective for extending shelf life. Some treatments will be subject to allergen labelling due to a content of sulphites although none of these alternatives exhibited the same operational hazards as sodium metabisulphite. Non sulphite based treatments can be an

effective option for suppliers wishing to extend shelf life and market an allergen free product.

It is recommended that all suppliers should confirm the requirements of their buyers before altering current dipping procedures.

Further information

Further information and contact details for all treatments are summarised on the following table. Inclusion in this table in no way infers that Seafish endorses the use of these products and it is hoped that the information supplied will allow all interested parties to make the correct choice for their business interests.