

Iodized Salt Profile at Regional Markets in East Java According to the Indonesian National Standard Analyzed by Spectrophotometric Method

Research Article

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Abstract

Background and Objectives: A study on the iodine contents of iodized salt at regional markets in Blitar, Ngawi, Gresik, and Pasuruan districts, East Java Province has been held by analysing 202 samples of various brands from 21 regional markets. Insufficiency of iodine intake could lead to symptoms of iodine deficiency and disturbances such as mumps, extreme fatigue, mental retardation, and depression that collectively called IDD. Therefore, the measurement of iodate in salt sample is important to know the difference of iodine contents in some salt samples that might be influenced by certain conditions, such as environments, transportation, package, and cooking methods.

Methods: The measurement of iodine-contents was done using the spectrophotometric method on λ 288 nm to λ 352 nm wavelength.

Results: The research revealed that in Blitar district, 20% iodized salt meet the Indonesian National Standard (SNI), while 80% did not meet the standard. In Ngawi district, 54% met the standard and 46% did not. In Gresik district, 50% meet the standard and 50% did not. In Pasuruan district, 50% met and 50% did not meet the standard.

Conclusions: There is still circulating salt that does not meet the requirements of SNI (a minimum of iodine-containing 30 ppm) and even some salt in circulation are still contain no iodine.

Keywords: Iodine-contents; Indonesian National Standard (SNI); Iodine; Spectrophotometric; East Java; Province.

Introduction

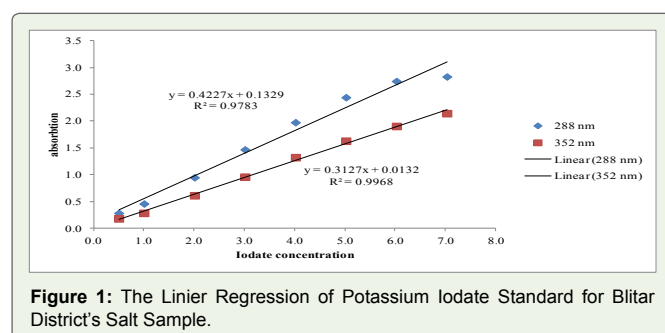
Iodine is a trace element compound which is important for human's nutrition. The World Health Organization (WHO) recommends 100mg/day for infants and 150mg/day for adult's intake of iodine [1]. Iodine is essential for synthesizing T3 and T4 hormones by thyroid glands [2]. The deposit of iodine in human body is the

thyroid gland. Insufficiency of iodine intake could lead to symptoms of iodine deficiency and disturbances such as mumps, extreme fatigue, mental retardation, and depression that collectively called IDD.

In 2015, WHO data shows there were 130 countries with IDD problems, 48% in Africa, 41% in South East Asia and 11% in Europe

Table 1: The Linear Regression Measurement & Standard Correlation Coefficient KIO_3 For Blitar Sample.

ppm	λ 288 nm	λ 352 nm
0.502	0.2853	0.1827
1.004	0.4600	0.2862
2.008	0.9489	0.6142
3.012	1.4700	0.9607
6	1.9766	1.3248
5.020	2.4427	1.6317
6.024	2.7452	1.9062
7.028	2.8293	2.1456



and West Pacific. In Indonesia, between 1982 and 1990, the IDD prevalence decreased from 37.2% to 27.7%, and in 1998 became 9.8%, while in 2003 the IDD prevalence slightly increased to 11.1% [3]. It could be seen from the number of hyperthyroid and hypothyroid patients that were found almost in all regions in Indonesia. There are natural sources of iodine that can be found in food, including milk, vegetables, fruits, cereals, eggs, meat, spinach, and seafoods [4]. Yet, these natural sources of iodine might not fulfill the standard required by human bodies, because of the contents are too small [5-7].

The sufficient iodine intake could be done by consuming iodized salt. Iodized salt are made by adding iodate to salt sample, since it has good stability and bioavailability [8]. Therefore, the measurement of iodate in salt sample is important to know the difference of iodine contents in some salt samples that might be influenced by certain conditions, such as environments, transportation, package, and cooking methods [9].

It is known that the salt distributed in East Java Province, both for common consumption and for food industries' supply, should meet the Indonesian National Standard (SNI); There is also a Local Regulation issued by the East Java government number 11 in 2011 about community nutrition, since there were still many nutritional deficiency disease and also micro and macro nutrition insufficiency which cause stunted growth in East Java Province. In the local regulation, article 21 a, stated that the Counter measurement of IDD was done by strengthening various fortification efforts. The problem is whether or not the fortification of Potassium Iodate in salt production done homogeneously by farmers in order to meet the SNI in 2010 with minimum contents more than 30ppm.

Therefore, this research would examine the iodine content in iodized salt that are distributed at four regional markets in Blitar, Ngawi, Gresik and Pasuruan district. Blitar and Ngawi districts were chosen to represent area with no salt producer, while Gresik and Pasuruan represented the areas with many salt producers. The study was done by using UV-V is spectrophotometric method with 288nm and 352nm wavelength.

Methods

The method of spectrophotometric measuring equipment used in this study was the Spectrophotometer HP 8452A. Other equipment were funnels, measuring cups, volumetric flasks, and other glass equipment.

The materials used were analytical grade materials and dissolved in aquadest. The materials were Potassium iodide (E. Merck), potassium iodate (E. Merck), various brands of salt, and sodium chloride (E. Merck). NaOH, HCl. The solution was dissolved in demineralized aquadest in Erlenmeyer flask. The calibration curves was processed by using Microsoft Excel.

Results

Blitar District

The total population of Blitar District is 1,268,194 persons (637,419 females and 630,775 males). Area of that district is about 1,588 km²; the population density is 700 persons/km². The district consists of 22 sub-districts and 248 villages. Location of that district is from 111°40' till 112°10' east longitude and 7°58' till 8°9'51" south latitude. Labor force sectors are agricultural (60%), service (25%), and manufacture (15%).

This is the profile of iodized salt in Blitar district markets, by March - August 2015. According to the SNI (Indonesian National Standard) requirement, majority (80%) of salt consumption do not meet the standard whilst the rest (20%) meet the standard. Both of salts are sold in 62 traditional markets in Blitar. Types of those SNI salts are briquettes (11%), coarse (33%), and refined (56%). As the reagent, 3.32gr KI was dissolved in aquadest until 100mL (KI 3.32%), add 5gr NaCl that has been dissolved in aquadest until 50mL (NaCl 10%), and 85% phosphoric acid made by dissolving 11.5gr phosphoric acid in aquadest until 100mL.

The Potassium Iodate (KIO_3) standard solution was made by dissolving 0,1000gr KIO_3 in 100mL volumetric flask, added with

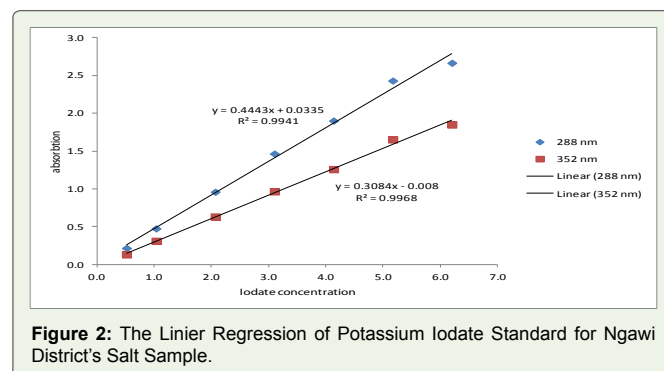


Table 2: Iodine Content in Various Iodized Salt Brands in Blitar Regency

Brand	Salt type	Producer's address	Contents (ppm)
Ibu Bijak	Refined	Gresik district	16.3737
2 Anak Pintar	Coarse	PT. Budiono Indonesia	4.06786
2 Santri	Briquettes	Pasuruan district	9.96598
86	Briquettes	Pasuruan district	9.37268
9	Coarse	Pasuruan district	9.44499
A P	Coarse	East Java	-0.5982
A S	Coarse	Sidoarjo city	2.59247
A.P	Refined	East Java	7.55133
Anak Kembar	Coarse	Pasuruan district	13.479
Berkah Inti Utama	Briquettes	Kediri district	14.3014
Bintang Madura	Coarse	PT. Budiono Indonesia	2.48422
Bintang Sembilan	Coarse	Indonesia	0.3748
Cendikiawan	Coarse	East Java	-2.7272
Cerdik	Refined	Surabaya city	72.6869
G	Coarse	Sampang district	27.4499
G	Briquettes	Kediri district	26.695
G Anyar	Coarse	Kediri district	55.3096
G G	Coarse	Pasuruan district	18.1445
G S	Coarse	Sidoarjo city	5.97721
G.S	Refined	Sidoarjo city	8.18196
Gedong Songo	Briquettes	Pati district – Central Java	12.6824
Ikan Layang	Refined	PT. Elitestar Prima Jaya	46.6136
Indomaret	Refined	Indomaret	61.3339
Jagung	Refined	Pasuruan district	2.58988
Kapal	Refined	Surabaya city	65.4472
Kapal Layar	Refined	Pasuruan district	4.26818
Karapan Sapi	Refined	Indonesia	21.7809
Macan	Briquettes	Jombang district	36.0019
Macan	Briquettes	Jombang district	24.4886
Maju Jaya	Coarse	Pasuruan district	-1.3111
Refina	Refined	Sidoarjo city	46.8543
S	Refined	Pasuruan district	45.3906
S	Briquettes	Pasuruan district	64.9405
S A	Coarse	Blitar district	28.2313
S G	Coarse	Kediri district	9.05573
S G	Briquettes	Kediri district	19.2197
S.G	Refined	Kediri district	4.44521
Sarcil	Coarse	Surabaya city	50.3378
Segi Biru	Coarse	UD. Berkah Inti Utama	25.8741
Segitiga G	Refined	Sampang district	32.9568
Segitiga PS	Refined	Kediri district	25.0385
Sinar Laut	Coarse	Indonesia	3.80876
Sumatraco	Coarse	Surabaya city	65.5135
Tali Bumi	Coarse	Pasuruan district	9.91339
No brand	Coarse	-	10.534
No brand	Coarse	-	10.6408

Table 3: The Linear Regression Measurement & Standard Correlation Coefficient KIO₃ for Ngawi Sample.

ppm	λ 288 nm	λ 352 nm
0.517	0.2159	0.1322
1.034	0.4753	0.3106
2.068	0.9596	0.6322
3.102	1.4645	0.9650
4.136	1.9009	1.2591
5.170	2.4298	1.6521
6.204	2.6651	1.8492

aquades until exactly to the 1000ppm mark. Put 10mL KIO₃ standard solution 1000ppm into 100mL volumetric flask, and add aquades to the 100mL mark (100ppm).

The Potassium Iodate (KIO₃) standard solution was made by dissolving 0,1000gr KIO₃ in 100mL volumetric flask, added with aquades until exactly to the 1000ppm mark. Put 10mL KIO₃ standard solution 1000ppm into 100mL volumetric flask, and add aquades to the 100mL mark (100ppm).

Calibration curve was made by dissolving 0.05mL to 0.6mL KIO₃ 100ppm standard solution + 1mL 3.32% KI solution + 2mL 10% NaCl solution + 1mL phosphoric acid + added with aquades to 10mL. Form: 1mL 3.32% KI solution + 1mL phosphoric acid + aquades until 10mL. Examined by spectrophotometer in 288 nm and 352 nm wavelength. Regression: $y = bx + a$ (y = absorbent; x = concentration).

Sample preparation; 0.2000gr salt sample dissolved with some aquades (ultrasonic) + 1mL 3.32% KI solution + 1mL phosphoric acid + added with aquades to 10mL. Examined by spectrophotometric method in 288 nm and 352 nm wavelength.

Types of those non SNI salts in Blitar District are briquettes (20%), refined (29%), and coarse (51%). The SNI iodine salt consumption are from PT. Elitestar (11%), Indomaret (11%), Pasuruan (11%), Kediri (11%), Sidoarjo (11%), and Surabaya (45%).

Ngawi District

Total population of Ngawi District is 911,911 persons (463,487 females and 448,424 males). Area of that district is about 1,298 km²; the population density of is 705 persons/km². In that area there are 19 sub-districts and 217 villages. Location of that district is from 7°21' till 7°31' south latitude and 110°10' till 111°40' east longitude. Sectors of labor force are agricultural (90%) and service (10%).

This is the profile of iodized salt sold in 29 traditional markets in Ngawi District, by March–August 2015. Based on the SNI requirement, majority (54%) of salt consumption meet the standard, whilst the rest (46%) do not meet the standard. Both of salts are available in 29 Ngawi traditional markets. Types of those SNI salts are coarse (21%), briquettes (32%), and refined (47%).

Types of those non SNI salts in Ngawi District are briquettes (13%), refined (37%), and coarse (50%). The SNI iodine salt consumption are from Sampang (5%), Surabaya (21%), Sidoarjo (21%), and Pati (53%).

Table 4: Iodine Contents in Various Iodized Salt Brands in Ngawi District.

Brand	Salt type	Producer's address	Contents (ppm)
Bintang	Coarse	Ngawi district	16.94155
Burung Laut	Coarse	Batangan – Pati. Central Java	26.95144
Burung Laut	Briquettes	Pati – Central Java	51.1671
Cah Ndut	Briquettes	Juwana-Pati. Central Java	57.7638
Cerdik	Refined	Surabaya city	56.06735
D	Refined	Sidoarjo district	32.58838
D	Refined	Sidoarjo district	31.95315
Dan Dut	Briquettes	Juwana-Pati. Central Java	38.65876
Dan Dut	Coarse	Juwana-Pati. Central Java	44.67962
Dara Ndut	Briquettes	Juwana-Pati, Central Java	39.48079
Daun	Refined	Sidoarjo district	63.94747
Dian Dut	Briquettes	Juwana-Pati, Central Java	74.71235
Dian Dut	Briquettes	Pati – Central Java	56.83408
Gadjah	Refined	Pati – Central Java	25.91788
Gajah Bulan	Refined	Pati – Central Java	36.50799
Gajah Bulan	Refined	Pati – Central Java	63.37346
Gajah Duduk	Coarse	Pati – Central Java	37.55598
Gajah Duduk	Coarse	Juwana-Pati. Central Java	35.53776
GN	Refined	Pati – Central Java	61.58537
Gunung Laut	Coarse	Batangan - Pati, Central Java	54.93943
IBRD	Coarse	Ngawi district	25.57761
Ibu Koki	Refined	Juwana-Pati, Central Java	17.36607
Ikan Layang	Refined	Gresik district	28.92612
Ikan Layang	Refined	Gresik district	35.25855
Ikan Layang	Refined	Gresik district	28.81951
Jempol	Refined	Surabaya city	68.83729
Jempol	Refined	Sampang district	69.36962
KM	Coarse	Pati – Central Java	14.24312
Koki Baru	Briquettes	Pati – Central Java	62.47277
Koki Baru	Briquettes	Pati – Central Java	54.06805
Kokiku	Briquettes	Bumimulyo-Batangan	53.57445
Kokiku	Briquettes	Batangan – Pati, Central Java	34.18673
Kupu	Coarse	Batangan – Pati, Central Java	28.3006
Mas Koki	Briquettes	Pati – Central Java	111.9923
Meja Daun	Refined	Batangan – Pati, Central Java	56.19684
Naga	Briquettes	NA	18.21074
Ndan Ndut	Briquettes	Batangan – Pati, Central Java	39.00957
NG	Briquettes	Surabaya city	27.20783
NG	Briquettes	Surabaya city	100.1284
R	Refined	Sidoarjo district	40.60887
Reco	Refined	PT. Maju Makmur	22.19066
Reco	Coarse	PT. Maju Makmur	17.64148
Refina	Refined	Sidoarjo district	37.33492

Refina	Refined	Sidoarjo district	52.83103
RN	Refined	UD Rizky Utomo	13.92854
S	Coarse	Surabaya city	31.88989
Segitiga G	Refined	Sampang district	37.27662
Segitiga G	Refined	Sampang district	50.69062
Segitiga G	Coarse	Sampang district	22.06598
Segitiga G	Refined	Sampang district	61.46716
Segitiga G	Briquettes	Sampang district	1.273601
Segitiga M	Refined	Nganjuk district	8.485078
Segitiga Sriti	Coarse	Sidoarjo district	17.89734
SG	Refined	Kediri district	16.02636
SG	Refined	Kediri district	22.49585
SJ	Coarse	UD Davint	18.16323
Star Dut	Briquettes	Rembang – Central Java	66.5469
Tito	Coarse	Batangan – Pati, Central Java	9.653584
Tito	Coarse	Pati – Central Java	22.52767

Table 5: The Linear Regression Measurement & Standard Correlation Coefficient KIO₃ for Gresik Sample .

ppm	λ 288 nm	λ 352 nm
0.529	0.29521	0.20448
1.058	0.47517	0.30348
2.116	1.0019	0.66183
3.174	1.4839	0.9738
4.232	1.9564	1.2964
5.29	2.4244	1.6493

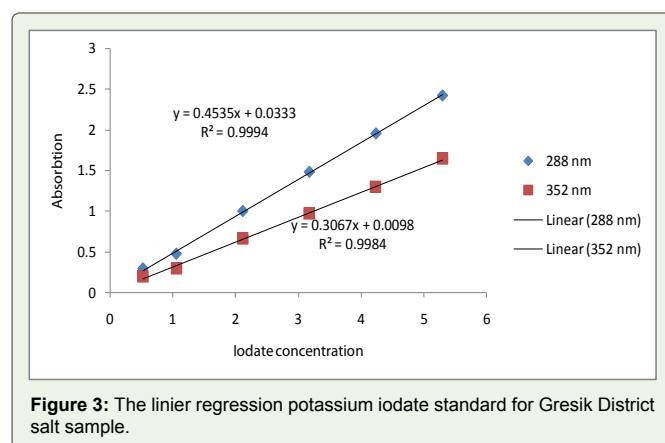


Figure 3: The linier regression potassium iodate standard for Gresik District salt sample.

Gresik District

Total population of Gresik District is 1,324,777 persons (657,209 females and 667,568 males). Area of that district is about 1,191 km²; the population density is 1,112 persons/km². The area consists of 18 sub-districts and 356 villages. Location of that district is from 112° till 113° east longitude and 7° till 8° south latitude. Labor force sectors are agriculture (60%) and service/manufacture (40%).

This is the profile of iodized salt in 22 traditional markets in Gresik District, by March - August 2015. Based on the SNI requirement, it is found that the standardized salt is as much as the non- standardized salt. Types of those SNI salts are coarse (8%) and refined (92%).

Table 6: Iodine contents in various iodized salt brands in Gresik District.

Brand	Salt Type	Producer's Address	Contents (ppm)
Anak Genius	Refined	East Java	13.9340
Cerdik	Refined	Surabaya city	33.9558
Daun Lompong	Refined	Sidoarjo district	27.9749
Gajah	Refined	Gresik district	44.7281
Gapuro Wali	Refined	Gresik district	5.6333
Garami	Refined	Surabaya city	71.6514
Ibu Bijak	Refined	Surabaya city	56.2716
Ikan Layang	Refined	Gresik district	55.7522
Indomaret	Refined	Surabaya city	54.9024
Kapal	Refined	Surabaya city	64.8099
Karapan Sapi	Refined	Surabaya city	75.5628
Kuda	Refined	Surabaya city	53.5746
Kuda	Briquettes	Surabaya city	44.6317
Lumbung Garam	Refined	Surabaya city	26.1507
Piala Mas	Briquettes	Pasuruan district	4.6104
PS	Refined	Mojokerto district	5.1167
Putra Tunggal	Refined	Sidoarjo district	22.3157
Segitiga Sarjana	Refined	Sidoarjo district	62.4135
Sriti	Refined	Surabaya city	11.2826
Cermat	Refined	Sidoarjo district	23.8741
Refina	Refined	Sidoarjo district	31.1824
No brand	Coarse	NA	-0.3633
No brand	Coarse	NA	12.0450
No brand	Coarse	NA	12.2329

Table 7: The linear regression measurement & standard correlation coefficient KIO₃ for Pasuruan sample.

ppm	λ 352 nm
0.523	0.14955
1.046	0.34406
2.092	0.61775
3.138	0.97867
4.184	1.1923
5.23	1.6774

Types of those non SNI salts in Gresik District are coarse (22%), refined (39%), and briquettes (39%).

The SNI iodine salt consumption are from Indomaret (8%), Gresik (17%), Sidoarjo (17%), and Surabaya (58%).

Pasuruan District

The total population of Pasuruan District is 1,510,261 persons (762,885 females and 747,376 males). Area of that district is 147.401 Ha; the population density is 1,024 persons/km². The district consists of 24 sub- districts and 365 villages. Location of this district is from 112°55' till 113°37' east longitude and 32°31' till 30°20' south latitude. Labor force sectors of this district are agriculture (60%) and service/manufacture (40%). There are 30 traditional markets available in this district.

This is the profile of iodized salt in 30 Pasuruan traditional

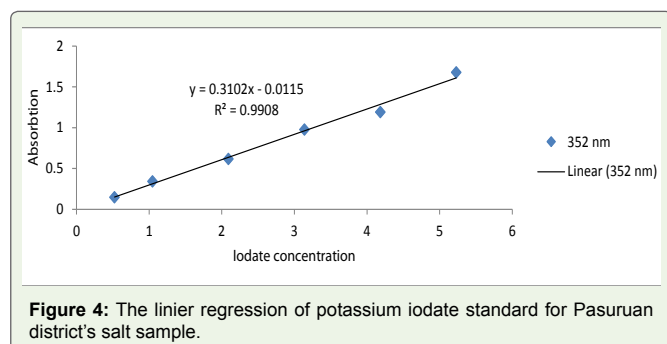


Table 8: Iodine contents in various iodized salt brands in Pasuruan District markets.

Brand	Type	Producer's address	Contents (ppm)
2 Anak Pintar	Briquettes	NA	14.7521
2 Anak Pintar	Briquettes	PT. Budiono Indonesia	1.31059
2 Anak Santri	Briquettes	Pasuruan district	21.0157
2 Putri	Briquettes	Pasuruan district	32.1333
2 Putri	Briquettes	Pasuruan district	12.4624
2 Putri	Briquettes	Pasuruan district	13.5596
2 Santri	Briquettes	Pasuruan district	19.4793
86	Briquettes	Pasuruan district	31.1479
86	Briquettes	Pasuruan district	11.3998
93	Briquettes	Pasuruan district	34.0805
Anak Kembar	Briquettes	Pasuruan district	20.563
Anak Kembar	Refined	Pasuruan district	14.2179
Anak Kembar	Briquettes	Pasuruan district	10.2349
Anak Kembar	Refined	Pasuruan district	20.4255
Anak Santri	Briquettes	Pasuruan district	25.6449
AP	Refined	East Java	15.2858
AP	Refined	East Java	9.83137
AP	Refined	East Java	29.6176
Armada Kapala Udara	Refined	NA	31.3787
Bintang Jaya	Briquettes	Pasuruan district	22.5903
Daun	Refined	Sidoarjo district	68.3894
Daun Lompong	Refined	Sidoarjo district	62.6108
Dolina	Refined	Bandung	62.1478
Garami	Refined	Surabaya city	83.1449
Garami	Refined	Surabaya city	52.0193
Garami	Refined	Surabaya city	52.9875
Garami	Refined	Surabaya city	89.4101
GS	Refined	Sidoarjo district	25.0743
GS	Refined	Sidoarjo district	13.0625
Jangkar	Briquettes	Probolinggo district	16.1609
Jet Kapal	Refined	East Java	30.9059

Kapal	Refined	Surabaya city	89.6041
Kapal	Refined	Surabaya city	51.1287
Kapal	Refined	Surabaya city	48.619
Kapal	Refined	Sidoarjo district	69.5711
Kapal	Refined	Surabaya city	24.7064
Kapal	Refined	Surabaya city	31.2641
Kapal	Refined	Surabaya city	78.2027
Kapal	Refined	Surabaya city	85.57
Kapal Helikopter	Refined	East Java	20.0903
Kapal Helikopter	Refined	East Java	12.0815
Kapal Helikopter	Refined	East Java	21.1445
Kapal Jungkang	Refined	Sidoarjo district	81.8212
Kapal Layar	Refined	Pasuruan district	10.9202
Kapal Layar	Refined	NA	15.2026
Kapal Pesiar	Refined	Sidoarjo district	16.2
Kapal Udara	Refined	NA	75.5995
Kepiting	Briquettes	Pasuruan district	31.9706
Perang Kapal	Refined	Sidoarjo district	28.2828
Piala Mas	Briquettes	Pasuruan district	21.2181
Piala Mas	Briquettes	Pasuruan district	30.1756
Piala Mas	Briquettes	Pasuruan district	27.8694
Putraku	Briquettes	Pasuruan district	23.4064
Refina	Refined	Sidoarjo district	91.3745
Refina	Refined	Sidoarjo district	58.698
Refina	Refined	Sidoarjo district	68.6431
Refina	Refined	Sidoarjo district	71.332
Sarinah	Refined	Surabaya city	29.0852
Sarinah	Refined	Surabaya city	91.9175
Sarinah	Refined	Surabaya city	43.7362
Segi A	Refined	East Java	46.9439
Sinar Abadi	Briquettes	Pasuruan district	20.7649
Sinar Abadi	Refined	Pasuruan district	22.5016

markets, by March-August 2015. As well as in Gresik District, it is found in Pasuruan District that the SNI standardized salt is as much as the non-standardized salt. Types of those SNI salts are coarse (12%), briquettes (16%), and refined (72%). On the other hand, types of the non-SNI salts are coarse (12%), refined (40%), and briquettes (48%). The SNI iodine salt consumption are from Sampang (4%), Bandung (8%), East Java (8%), not known (8%), Pasuruan (16%), without brands (16%), Surabaya (20%), and Sidoarjo (24%).

Conclusions

56% of refined salt, 33% of coarse salt and 11% of briquette salt in Blitar District were iodized salt that meet the SNI standard. 51% coarse salt, 29% refined salt, and 20% briquette salt in Blitar did not meet the SNI standard. The origin of iodized salt that meet the SNI standard in Blitar District were Surabaya 45%, Sidoarjo, Kediri,

Pasuruan, Indomaret and others were each 11%. While the iodized salt that did not meet the SNI standard were mostly came from Pasuruan (28%). In Ngawi district, 54% met the standard and 46% did not. Iodized salt that meet the SNI standard in Ngawi District was 47% of refined salt type, 21% of coarse type and 32% of briquette type. While the iodized salt that did not meet the SNI standard in Ngawi was 50% coarse, 37% refined and 13% briquette salt type. The origin of the iodized salt that meet the SNI standard in Ngawi were Pati 53%, Sidoarjo, Surabaya 21% each, and other regions 5%. While the iodized salt that did not meet the SNI standard was mostly came from Pati (32%). In Gresik district, 50% meet the standard and 50% did not. 92% refined salt and 8% briquette salt in Gresik District meet the SNI standard of iodized salt. While 22% coarse salt, 39% refined salt and 39% briquette salt in Gresik did not meet the SNI standard.

The origin of iodized salt that meet the SNI standard in Gresik District were Surabaya 58%, Sidoarjo, Gresik 17% each and other regions 8%. While the iodized salt that did not meet the SNI standard was mostly the iodized salt with no brands (25%). In Pasuruan district, 50% met and 50% did not meet the standard. 72% of refined salt, 12% coarse salt and 16% briquette salt in Pasuruan District meet the SNI standard. While 12 % coarse salt, 40% refined salt and 48% briquette salt did not meet the SNI standard. The origin of iodized salt that meet the SNI standard in Pasuruan were Surabaya 20%, Sidoarjo 24%, Pasuruan 16% and others 40%. While the iodized salt that did not meet the SNI standard was mostly came from Pasuruan (52%). There are still many iodized salt that did not meet the SNI standard in 2010 (minimal iodine-contain 30 ppm) distributed in markets, even

some of the distributed salt contain no iodine. Hopefully, the result of this research can be used for consideration of the East Java Local Government to uphold the regulation of iodized salt distribution that should meet the 2010 SNI standard.

References

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