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Market for Starch, Hemicellulose, Cellulose, Alginate, its Salts and Esters, and Natural Polymers, including Chitin and Chitosan: Analysis Results

Abstract

The objective of this paper is the presentation of the results of an analysis of selected polysaccharide markets, with special reference to starch, hemicellulose, cellulose, alginate, its salts and esters, and natural polymers, including the chitin and chitosan market. Research was conducted on the basis of Eurostat and Comtrade-UN statistical data for the years 2005-2007 for production, import, export, and market volumes of the countries of the "15" (the "old" member states of the European Union) as well as of the "12" new European Union member states (which became European Union members in 2004 and 2007). This analysis has demonstrated that over the years examined for the product groups analysed, the European Union markets for starch, hemicelluloses and cellulose, and natural polymers, including chitin and chitosan have the greatest development potential. There was only a lack of development potential in the alginate market. The dominant position on all of the markets analysed is occupied by producers from the countries of the "15". From among the new member states, the market position of Poland is, in most cases, among the most notable from amongst the countries of Central and Eastern Europe, where it is the highest on the European cellulose market (5.8%), followed by hemicellulose (3.6%), starch (approximately 3%), alginate (approximately 2%), and polymers, including chitin and chitosan (approximately 1%).

Key words: market analysis, polysaccharides, hemicellulose, cellulose, alginate salts, alginate esters, natural polymers, chitin, chitosan.

Introduction

The objective of this paper is the presentation of the results of an analysis of the markets for following: starch, hemicellulose, cellulose, alginate, its salts and esters, and natural polymers, including chitin and chitosan. Research was conducted on the basis of *Eurostat and Comtrade-UN* statistical data for the years 2005-2007 for production, import, export, and market volumes of the countries of the "15" (the "old" member states of the European Union) as well as of the "12" new European Union member states (which became European Union members in 2004 and 2007).

The analysis demonstrated that the markets for starch, hemicellulose, cellulose, and natural polymer, including the chitin and chitosan product groups are among the fastest developing of the European

Union. A lack of any development tendency was found only in the case of the alginate market. Manufacturers from the countries of the "15" hold a dominant position on all of the markets analysed. Among the new member states, the position of Poland is, in most cases, among the most significant from among the countries of Central and Eastern Europe and is the highest in the case of the European cellulose market (5.8%), followed by hemicellulose (3.6%) and alginate (approximately 2%), followed by polymers, including chitin and chitosan (approximately 1%).

Market analysis results for the product groups examined

Starches

Starch production in the European Union, in both the "old" member states—the European Union "15"—and in the "new" countries of the European Union, is among the production sectors with a high development potential, characterised by growth trends over the years 2005-2007. Production in the countries of the "15" increased from EUR 1,027 million in 2005 to EUR 1,988.3 million in 2007. In the case of the new member states, it increased from EUR 160.4 million to EUR 208.8 million over the same period. The share of the "15" grew by almost 90% for all production in 2006 and 2007, where

the new European Union member states had an approximately 10% share in the production of those years. Compared with the year 2005, successive years were marked by a concentration of production in the "old" member countries as compared with the "new" European Union member states. The highest share in starch production in the European Union was held by producers in Germany, France, the Netherlands, Italy, Spain and Belgium, followed by the Czech Republic, Poland and Slovakia. However, the new member states were marked by a clear downward trend with respect to their position in the total starch production in the European Union. A decided growth trend in terms of production share achieved was only characteristic of Spain and Belgium.

Starch imports into the European Union over the period examined also demonstrated a clear growth trend with respect to both the "old" and "new" member states. However, in the case of the first group, their share in total European Union imports fell from 91% to 89%, while the share of the second group grew from 8.5% to 11.2%. Imports of the "15" grew over the years 2005-2007 from EUR 428 million to EUR 583 million. For their part, imports of the twelve new member states increased from EUR 40 million to EUR 73 million. Among the most note-

Table 1. European Union – market volume; imports of starch and shares in imports of internal and external producers in 2005-2007.

Group of countries or country	Market volume and imports in mln EUR			Shares in %		
	2005	2006	2007	2005	2006	2007
EU /27/ – market volume	1133,02	1890,92	2188,12			
Total import of UE /27/	467,9	512,3	656,5	100,00	100,00	100,00
I. Internal imports of EU/27/	453,1	492,6	620,4	96,84	96,14	94,51
I.A. Main internal producers	366,3	411,9	511,7	78,3	80,4	77,9
1. France	92,9	101,9	142,4	19,86	19,89	21,69
2. Germany	122,4	133,7	128,2	26,16	26,10	19,53
3. Belgium	82,2	97,6	121,5	17,56	19,04	18,50
4. Italy	18,9	18,8	29,5	4,04	3,67	4,50
5. Austria	19,5	23,3	28,3	4,16	4,56	4,32
6. Denmark	18,1	22,3	26,8	3,87	4,36	4,09
7. Spain	10,3	12,0	21,3	2,21	2,34	3,25
8. Lithuania	0,0	0,3	11,3	0,00	0,06	1,73
9. Poland	2,0	1,9	2,3	0,42	0,37	0,35
II. External imports of EU/27/	14,8	19,8	36,0	3,16	3,86	5,49
II.A. Main external producers	12,1	17,5	32,0	2,6	3,4	4,9
1. USA	5,0	8,3	13,9	1,07	1,62	2,11
2. Thailand	6,5	8,1	13,5	1,39	1,58	2,06
3. Ghana	0,1	0,0	2,6	0,02	0,00	0,40
4. China	0,2	0,3	1,0	0,05	0,06	0,16
5. Australia	0,2	0,9	0,9	0,05	0,17	0,14

Source: Own calculations based on Eurostat and Comtrade data-bases.

Table 2. European Union – market volume of starch and its structure in 2005-2007.

Group of countries or country	Market volume in mln EUR			Structure of market volume in %		
	2005	2006	2007	2005	2006	2007
EU /27/	1133,02	1890,92	2188,12	100,00	100,00	100,00
„Old members” – 15	964,77	1685,27	1953,86	85,15	89,12	89,29
„New members” – 12	168,25	205,65	234,26	14,85	10,88	10,71
1. France	69,9	203,0	390,5	6,17	10,74	17,85
2. Netherlands	54,0	280,3	249,8	4,76	14,82	11,42
3. Germany	343,9	364,0	378,0	30,35	19,25	17,28
4. Italy	135,7	261,4	319,5	11,98	13,83	14,60
5. United Kingdom	66,6	87,4	108,9	5,88	4,62	4,98
6. Ireland	3,7	3,7	2,9	0,32	0,20	0,13
7. Denmark	74,5	71,6	18,9	6,57	3,79	0,86
8. Greece	7,8	9,9	13,1	0,69	0,52	0,60
9. Portugal	4,1	15,7	15,2	0,36	0,83	0,70
10. Spain	78,0	176,4	215,3	6,88	9,33	9,84
11. Belgium	55,8	127,2	150,1	4,93	6,73	6,86
12. Luxemburg	0,5	0,4	0,4	0,04	0,02	0,02
13. Sweden	17,4	28,4	22,6	1,54	1,50	1,03
14. Finland	46,3	38,5	41,2	4,09	2,04	1,88
15. Austria	6,7	17,4	27,3	0,59	0,92	1,25
16. Malta	0,6	0,8	1,2	0,05	0,04	0,05
17. Estonia	0,9	1,1	1,3	0,08	0,06	0,06
18. Latvia	5,6	7,8	5,4	0,49	0,41	0,24
19. Lithuania	4,4	5,4	5,7	0,38	0,29	0,26
20. Poland	40,3	59,9	60,1	3,56	3,17	2,75
21. Czech Republic	66,7	78,9	98,6	5,88	4,17	4,50
22. Slovakia	35,6	35,9	39,3	3,14	1,90	1,80
23. Hungary	2,7	3,4	3,4	0,24	0,18	0,15
24. Romania	7,7	7,7	14,3	0,68	0,41	0,65
25. Bulgaria	0,7	1,3	0,5	0,06	0,07	0,02
26. Slovenia	2,7	3,0	4,0	0,24	0,16	0,18
27. Cyprus	0,4	0,4	0,6	0,04	0,02	0,03

Source: Own calculations based on Eurostat data-base.

worthy importers of starch, coupled with their growing position in European Union imports, were Germany, France, Great Britain and the Netherlands. An important position, albeit showing a slight fall, was also achieved in the case of Italy, Spain, Belgium and Sweden. In the case of the new member countries, the highest position was held by Poland, followed by the Czech Republic and Romania. Apart from deliveries of starch for the Single European Market from suppliers from the European Union member states, **deliveries of starch originating from countries outside the European Union** were also on the increase, the most important outside suppliers of which included the United States, Thailand, Ghana, China, and Australia. The total share of these countries in the delivery of starch to the European market did not exceed a 5.5% share of the whole of imported deliveries. (See *Table 1*)

The countries of the European Union were also significant **exporters** of starch, with a growing trend in exports from EUR 362 million in 2005 to EUR 457 million in 2007, of which the countries of the “15” held an approximately 90% share, with the “new” European Union countries accounting for approximately 10%. The highest positions in starch exports were occupied by two countries—Germany and the Netherlands, which achieved over 60% of the total share of exports. A relatively high and growing share in exports was observed in the case of Spain and Poland, followed by Slovakia and the Czech Republic.

The results presented above are also reflected in the starch **market volume** over the years examined, as presented in *Table 2*. This volume was characterised by a clear growth tendency in the case of both groups of European Union states, a slight fall in the position of the “15”, and by a slight increase in the share of new European Union member states. In 2007 the highest market position was achieved by France and Germany, followed by Italy, the Netherlands, Great Britain, Belgium, the Czech Republic, Poland, Sweden and Slovakia (see *Table 2*).

■ Hemicellulose

Hemicellulose production in the European Union over the years 2005-2007 was marked by a growth trend. In 2007 its level amounted to EUR 1,120.4 million, of which the countries of the “15”

represented almost 99%, while production in the “new” countries that entered the European Union after the year 2004 accounted for a mere 1%. Over half of European Union production comes from Ireland, with a 14% share held by Finland, 4.5% – by Austria and Great Britain, and approximately 2% in the case of Belgium and Sweden. Among the new member states, a very small share of European Union production was held by Lithuania (0.7%), Bulgaria (0.15%) and Poland (0.14%).

The import of hemicellulose into the European Union was also marked by a growth trend from EUR 1,193.5 million in 2005 to EUR 1,270.2 million in 2007, approximately 93% of which was to countries of the “15” and approximately 7% to the new European Union member states. The highest positions with respect to imports (approximately 20%) were occupied by France and Germany, with a difference, however – in the case of France, there was an upward tendency in its share of imports during the period examined, from 17% to 20%. Over the same period, Germany demonstrated a downward trend from 21% to 18% (see **Table 3**). A relatively high share was also held by the Netherlands (approximately 10%), Spain, Belgium (approximately 8% each), Denmark (approximately 5%), Finland, Poland (approximately 3% each), Austria, the Czech Republic (approximately 1.5% each) and Romania (approximately 1%).

Imports from outside the European Union to the Single European Market accounted for approximately 15% of the total imports, which represented a slightly downward tendency – down from 18% in 2005 to approximately 15% in 2007. Among the most important suppliers from countries outside the European Union to the European market were those from the United States, Japan, Switzerland, Argentina and China (see **Table 3**).

The export of hemicellulose from the European Union was marked by a slightly downward tendency from a level of EUR 1,598.2 million to EUR 1,541.6 million, of which the countries of the “15” held over an 98% share, while that of the new European Union member states was under 2%. The highest share in exports – almost 27% – was noted in the case of Denmark. A high and growing share was observed in the case of Germany, which achieved almost 18% in 2007, followed

Table 3. European Union – imports; market volume of hemicellulose and shares in imports of internal and external producers in 2005-2007.

Group of countries or country	Market volume and imports in mln EUR			Shares in %		
	2005	2006	2007	2005	2006	2007
EU /27/ – market volume	538,7	677,5	848,9			
EU /27/ – total imports	1193,5	1243,7	1270,2	100,00	100,00	100,00
Including:						
I. Internal imports	972,8	1037,2	1082,3	81,51	83,40	85,21
I.A. Main internal producers	878,6	932,9	993,8	73,6	75,0	78,2
1. Netherlands	273,1	260,1	263,6	22,89	20,91	20,75
2. Denmark	186,8	217,0	255,8	15,65	17,44	20,14
3. Germany	138,6	128,8	126,2	11,61	10,36	9,94
4. France	86,1	89,7	97,4	7,22	7,21	7,67
5. Finland	69,2	87,3	93,6	5,80	7,02	7,37
6. Belgium	69,2	93,1	93,4	5,80	7,48	7,35
7. United Kingdom	10,3	12,0	21,3	0,87	0,97	1,68
8. Ireland	26,4	25,9	20,9	2,21	2,08	1,65
9. Austria	17,4	17,1	19,4	1,46	1,37	1,53
10. Poland	1,4	2,1	2,1	0,11	0,17	0,17
II. External imports	220,7	206,5	187,9	18,49	16,60	14,79
II.A. Main external producers	195,7	172,8	153,5	16,4	13,9	12,1
1. USA	99,0	97,4	76,6	8,30	7,83	6,03
2. Japan	39,8	41,0	36,9	3,33	3,30	2,90
3. Switzerland	38,1	16,9	16,0	3,19	1,36	1,26
4. Argentina	8,4	8,7	13,6	0,70	0,70	1,07
5. China	10,5	8,8	10,4	0,88	0,71	0,82

Source: Own calculations based on Eurostat and Comtrade – UN data-bases.

Table 4. European Union – market volume of hemicellulose and its structure in 2005-2007.

Group of countries or country	Market volume in mln EUR			Structure of market volume in %		
	2005	2006	2007	2005	2006	2007
EU /27/	538,7	677,5	848,9	100,00	100,00	100,00
„Old members” – 15	463,4	599,3	769,5	86,02	88,45	90,64
„New members” – 12	75,3	78,2	79,4	13,98	11,55	9,36
1. France	48,4	51,6	73,5	8,98	7,62	8,65
2. Netherlands	-0,9	11,8	13,3	-0,16	1,74	1,56
3. Germany	84,7	59,6	111,9	15,73	8,79	13,18
4. Italy	84,7	73,1	74,4	15,72	10,79	8,76
5. United Kingdom	10,9	76,5	74,8	2,03	11,29	8,81
6. Ireland	-11,7	-46,2	15,0	-2,17	-6,81	1,76
7. Denmark	73,0	208,2	224,8	13,55	30,73	26,48
8. Greece	6,4	6,1	8,2	1,19	0,90	0,96
9. Portugal	8,5	9,3	11,9	1,58	1,37	1,41
10. Spain	102,1	99,5	94,5	18,94	14,68	11,13
11. Belgium	-7,9	1,0	0,9	-1,46	0,15	0,11
12. Luxemburg	10,9	10,8	7,2	2,02	1,59	0,84
13. Sweden	44,5	37,0	31,4	8,26	5,46	3,70
14. Finland	9,5	-6,7	17,6	1,76	-0,99	2,07
15. Austria	0,3	7,6	10,3	0,06	1,13	1,21
16. Malta	0,1	0,1	0,0	0,03	0,02	0,00
17. Estonia	0,5	0,4	0,5	0,10	0,06	0,06
18. Latvia	0,7	0,7	0,7	0,12	0,10	0,08
19. Lithuania	1,9	1,6	1,6	0,35	0,24	0,19
20. Poland	32,3	30,3	30,9	5,99	4,47	3,64
21. Czech Republic	10,5	15,5	17,2	1,96	2,28	2,02
22. Slovakia	1,7	1,6	2,0	0,31	0,24	0,23
23. Hungary	9,0	8,6	8,6	1,67	1,27	1,01
24. Romania	10,8	12,4	11,5	2,00	1,82	1,35
25. Bulgaria	4,6	4,8	3,0	0,85	0,71	0,36
26. Slovenia	2,7	1,8	2,9	0,50	0,26	0,34
27. Cyprus	0,5	0,5	0,5	0,10	0,08	0,06

Source: Own calculations based on Eurostat data-base.

Table 5. European Union – imports; market volume of cellulose and shares in imports of internal and external producers in 2006-2007.

Group of countries or country	Market volume and imports in mln EUR		Shares in %	
	2006	2007	2006	2007
EU/27 – Market volume	1023,1	1111,2		
EU/27 – Total imports	1217,3	1328,6	100,00	100,00
Including:				
I. internal imports	811,5	915,9	66,67	68,93
I.A. Main internal producers	745,8	839,6	61,27	63,19
1. Germany	253,2	318,0	20,80	23,93
2. Netherlands	124,6	126,8	10,24	9,55
3. Belgium	96,2	116,8	7,90	8,79
4. France	103,3	108,0	8,48	8,13
5. United Kingdom	69,3	64,7	5,70	4,87
6. Finland	35,1	36,9	2,88	2,78
7. Ireland	31,7	35,0	2,60	2,64
8. Italy	31,2	31,4	2,56	2,37
9. Poland	1,2	2,0	0,10	0,15
II. External imports	405,8	412,7	33,33	31,06
II.A. Main external producers	370,7	376,0	30,45	28,30
1. USA	261,0	248,6	21,44	18,71
2. Japan	52,9	47,0	4,35	3,54
3. Rep. of South Korea	20,3	35,4	1,66	2,66
4. China	14,1	24,2	1,16	1,82
5. Mexico	22,4	20,7	1,84	1,56

Source: Own calculations based on Eurostat and Comtrade-UN data-bases.

Table 6. European Union – market; volume of cellulose and its structure in 2006-2007.

Group of countries or country	Market volume in mln EUR		Structure of market volume in %	
	2006	2007	2006	2007
EU /27/	1023,1	1111,2	100,00	100,00
„Old members” – 15	873,1	945,0	85,34	85,04
„New members” – 12	150,0	166,2	14,66	14,96
1. France	131,1	146,6	12,81	13,19
2. Netherlands	71,6	68,0	7,00	6,12
3. Germany	226,1	209,8	22,10	18,88
4. Italy	145,4	233,3	14,21	20,99
5. United Kingdom	50,6	51,7	4,95	4,66
6. Ireland	37,6	35,9	3,67	3,23
7. Denmark	21,3	19,5	2,09	1,75
8. Greece	17,0	17,2	1,66	1,55
9. Portugal	11,1	11,3	1,09	1,02
10. Spain	132,5	143,9	12,95	12,95
11. Belgium	-69,5	-66,3	-6,79	-5,96
12. Luxemburg	3,8	0,9	0,37	0,08
13. Sweden	43,0	42,7	4,20	3,84
14. Finland	28,5	4,2	2,79	0,38
15. Austria	22,9	26,2	2,24	2,36
16. Malta	0,7	0,8	0,07	0,07
17. Estonia	0,8	0,9	0,08	0,08
18. Latvia	2,6	3,6	0,26	0,33
19. Lithuania	12,4	14,2	1,21	1,28
20. Poland	62,8	64,2	6,14	5,77
21. Czech Republic	14,4	16,2	1,41	1,45
22. Slovakia	5,1	5,7	0,50	0,51
23. Hungary	19,1	21,3	1,86	1,91
24. Romania	17,9	23,8	1,75	2,14
25. Bulgaria	-0,7	-1,3	-0,07	-0,12
26. Slovenia	12,5	14,2	1,22	1,28
27. Cyprus	2,4	2,7	0,24	0,24

Source: Own calculations based on Eurostat data-base.

by France and Finland, which had a share of almost 12% each, the Netherlands (approximately 10%), Belgium (approximately 8%), Great Britain and Austria (approximately 4% each). The shares of new member states were very small. The highest was achieved by Poland (0.67%), Lithuania (0.57%) and Bulgaria (0.20%).

The results obtained from previous tables is mirrored in the **market volume of hemicellulose** over the years examined, as presented in **Table 4**. This volume was marked by a clear growth tendency in both groups of European Union countries. The positions of the “15” improved from 86% to almost 91%, with a decided fall in the share of the new European Union member states from almost 14% to 9.4% (see **Table 4**). The highest market position was achieved in 2007 by Denmark (26.5%), then Germany (13%), followed by Spain (11%), France, Great Britain, Italy (almost 9% each), Sweden, Poland (almost 4% each), Finland, the Czech republic (2% each), the Netherlands (1.5%), Austria and Romania (approximately 1% each) (for detailed data of the countries of the European Union see **Table 4**).

■ Cellulose

Cellulose production in the European Union over the years 2006–2007 was marked by an upward trend. In 2007 it amounted to EUR 1,294.5 million, of which the countries of the “15” comprised 99% of production, whereas the “new” countries, which entered the European Union after the year 2004, had a less than 1% share. Approximately 45% of European Union production was in Germany, with approximately 13% in the Netherlands, over 8% in Sweden, over 6% in Finland, and over 4.5% in Great Britain. Among the new member states, the greatest share in production was achieved by Poland and the Czech Republic – 0.55% and 0.22%, respectively.

Cellulose imports to the European Union over the years 2006–2007 were marked by a growth trend from a level of USD 1,210 million to USD 1,319 million, approximately 87% of which was to countries of the “15”, with approximately 13% to the new member states. The greatest share in European Union imports was achieved by Germany (approximately 16%), Belgium (14%), Italy (13%), Spain (approximately 10%), France (almost 8%), Great Britain (approximately 7%), the

Netherlands (approximately 6%), Poland (almost 5%), Austria, Ireland, Romania, Hungary (approximately 2% each), and Slovenia (approximately 1%).

Imports from outside the European Union to the Single European Market in 2007 amounted to approximately 31% of total cellulose imports, which represented a slightly downward tendency – down from 33% in 2006 to approximately 31% in 2007. Among the most important suppliers from countries outside the European Union to the European market were suppliers from the United States, Japan, South Korea, China, and Mexico (see *Table 5*).

Cellulose exports were marked by a slight growth trend in the European Union over the period 2006-2007. It was characterised by an increase in exports from USD 1,448 million in 2006 to USD 1,503 million in 2007. Of these values, the countries of the “15” represented over 99%, while the new European Union member states had less than 1%. The highest position with respect to exports, with a share of almost 29%, was held by Germany, followed by Belgium, with a share of approximately 18%, France (approximately 12%), Great Britain (approximately 7%), Finland, Ireland, and Sweden (approximately 6% each). From among the new European Union member states, the highest share in exports of cellulose in the European Union, amounting to 0.26%, was held by Poland, followed by Slovenia (0.12%), the Czech Republic and Bulgaria (0.10% each).

The results of previous tables are reflected in the **cellulose market volume**, as presented in *Table 6*, over the years examined. This volume demonstrated an upward tendency in both groups of European Union countries, with a fixed position of the countries of the “15” at a level of approximately 85%, and the new member states representing approximately 15% (see *Table 6*). The highest market position in 2007 was achieved by Italy (21%), Germany (19%), France, Spain (approximately 13% each), Poland (almost 6%), Great Britain (almost 5%), Sweden (almost 4%), Austria and Romania (2% each) (for detailed data of the European Union countries see *Table 6*).

■ Alginate, its salts and esters

The production of alginate, its salts and esters was relatively small in the

Table 7. European Union – imports and market volume of alginate, its salts and esters; shares of internal and external producers in 2006-2007.

Group of countries or country	Market volume and imports in mln EUR		Shares in %	
	2006	2007	2006	2007
EU/27/ – Market volume	87,1	57,5		
EU/27/ – Total imports	87,8	97,7	100,00	100,00
Including:				
I. Internal imports	46,0	51,5	52,37	52,72
I.A. Main internal producers	45,5	50,8	51,9	52,0
1. France	15,7	16,2	17,84	16,59
2. Germany	6,9	8,6	7,85	8,76
3. United Kingdom	7,2	6,9	8,20	7,06
4. Belgium	6,8	6,7	7,74	6,85
5. Netherlands	3,2	3,9	3,63	4,03
6. Sweden	2,1	3,6	2,41	3,64
7. Denmark	2,2	3,1	2,48	3,17
8. Italy	1,5	1,8	1,71	1,83
9. Poland	0,0	0,0	0,03	0,03
II. External imports	41,8	46,2	47,63	47,28
II.A. Main external producers	38,0	41,9	43,3	42,9
1. Norway	26,5	28,6	30,15	29,32
2. China	6,3	8,5	7,21	8,70
3. USA	3,0	2,1	3,37	2,11
4. Japan	1,2	1,6	1,33	1,63
5. Mexico	1,1	1,1	1,27	1,13

Source: Own calculations based on Eurostat and Comtrade-UN data-bases.

European Union. In 2006 it amounted to EUR 93.1 million, falling to EUR 62.6 million in 2007; I in 2006 a total share of 93% was held by the countries of the “15” and approximately 7% by the new member states. However, in 2007 the share of the “old” member states fell to 83% in favour of the new European Union member states, which increased their share to almost 17%.

Production of the products analysed in the European Union was dominated by a small number of producers, among which Great Britain was dominant (a share of over 46%), followed by France (with a share of 34%), the Czech republic (a share of almost 10%), Slovakia (a share of approximately 7%), and Sweden, whose share in the manufacture of the products examined has fallen over the past two years from 35% to 2.2%.

The import of alginate, its salts and esters to the European Union was at a level of EUR 84–94 million over the years 2006–2007. Imports were concentrated, with an almost 97% share going to the countries of the “15”, while the new European Union member states held an approximately 3% share. The greatest share in imports was held by Sweden (22%), followed by Germany (19%), Italy (almost 9%), France, Great Britain (approximately 7% each), Spain and Bel-

gium (almost 6% each). Among the new member states of the European Union, the greatest share in the import of the products examined was held by Poland (over 1%), Hungary and Romania (approximately 0.5% each).

Imports from outside the European Union to the Single European Market in 2007 amounted to over 47% of that of the total alginate, its salts and esters, the value of which had an upward tendency, from EUR 41.4 million to EUR 46.2 million over the years 2006–2007. Among the major suppliers from countries outside the European Union to the European market were those from Norway, China, the United States, Japan and Mexico (see *Table 7*).

Exports of alginate, its salts and esters demonstrated a clear growth trend in the European Union over the years 2006–2007, from a level of EUR 93.8 million to EUR 102.7 million, of which 99.95% was from the countries of the “15”, with a mere 0.05% from the new European Union member states (see *Table 7*). The main exporter of these products was Great Britain, whose share in exports amounted to 27.5%, then France, with a share of 22%, Sweden, with a share of approximately 18%, Germany, with almost 11%, Denmark, with a share of approximately 8%, and the Netherlands, with approximately 4%. Among

Table 8. European Union – market volume of alginate its salts and esters; its structure in 2006-2007.

Group of countries or country	Market volume in mln EUR		Structure of market volume in %	
	2006	2007	2006	2007
EU /27/	87,08	57,52	100,00	100,00
„Old members”– 15	77,38	43,90	88,86	76,32
„New members”– 12	9,70	13,62	11,14	23,69
1. France	8,89	5,94	10,20	10,32
2. Netherlands	0,14	0,56	0,16	0,97
3. Germany	8,80	7,92	10,10	13,76
4. Italy	5,11	4,59	5,87	7,98
5. United Kingdom	9,70	7,33	11,14	12,74
6. Ireland	-0,88	0,12	-1,01	0,21
7. Denmark	4,19	3,05	4,81	5,29
8. Greece	0,22	0,33	0,26	0,57
9. Portugal	0,37	0,56	0,43	0,97
10. Spain	4,50	5,35	5,17	9,30
11. Belgium	1,27	1,30	1,46	2,26
12. Luxemburg	0,00	0,00	0,00	0,01
13. Sweden	33,89	4,03	38,92	7,00
14. Finland	0,44	0,53	0,51	0,93
15. Austria	0,74	2,30	0,85	3,99
16. Malta	0,01	0,02	0,01	0,04
17. Estonia	0,05	0,09	0,06	0,15
18. Latvia	0,02	0,02	0,03	0,03
19. Lithuania	0,05	0,00	0,06	0,01
20. Poland	0,83	1,11	0,95	1,93
21. Czech Republic	5,09	6,42	5,84	11,17
22. Slovakia	2,00	4,60	2,30	7,99
23. Hungary	0,49	0,45	0,57	0,79
24. Romania	0,66	0,46	0,76	0,80
25. Bulgaria	0,32	0,22	0,37	0,37
26. Slovenia	0,16	0,23	0,18	0,39
27. Cyprus	0,01	0,01	0,01	0,02

Source: Own calculations based on Eurostat data-base.

the new European Union member states, Hungary's share in the export of these products was at a level of 0.03%, while that of the Czech Republic was 0.01%.

Results obtained from previous tables are reflected in the market volume of **alginate, its salt and ester** over the years examined, as presented in **Table 8**. For both groups of European Union countries the volume demonstrated a downward tendency from a level of EUR 87 million in 2006 to ENR 57.6 million in 2007. The share position of the countries of the "15" also fell from 88.9% to 76.3% over the years examined, while that of the new European Union member states grew from 11% to almost 24% (see **Table 7**). In 2007 the most notable market share was achieved by Germany (13.8%), followed by Great Britain (12.7%), the Czech Republic (11.2%), France (10.3%), Spain (9.3%), Italy, Slovakia (8% each), Denmark (5.3%), Austria (4%), Poland (2%), the Netherlands and Romania (almost 1% each) (for detailed data of the countries of the European Union see **Table 7**).

Natural polymers, including chitin and chitosan

The production of natural polymers, including chitin and chitosan, in the European Union was marked by a clearly growing trend over the years 2006-2007. In 2007 its level reached EUR 433 million as compared with EUR 385.5 million in 2006. In this case the countries of the "15" accounted for 96.86% in 2007 (an increase from 93.98% in 2006). As for the new European Union member states, in 2007 there was a 3.14% fall in their share of production as compared to 2006, when it amounted to approximately 6%. The highest share in production in 2007 was held by Finland (33.2%), which, compared with the previous year, achieved a growth in its share from approximately 17%. Finland was followed by Germany and Belgium, which had a share in polymer production of approximately 24% each. Among the other countries of the European Union, worth noting is the share of the Netherlands, amounting to approximately 6%, Spain 5%, Italy

4%, the Czech Republic approximately 2%, and Slovakia approximately 1%.

The import of natural polymer, including chitin and chitosan, to the European Union over the years 2006–2007 saw a downward trend from EUR 618 million to EUR 598 million in 2007. Of this figure, a share of approximately 97% was held by the countries of the "15", with approximately 3% for the "new" countries of the European Union. The highest position in terms of imports (over 53%) was occupied by France and Germany (with 11%), followed by Belgium (almost 9%), Great Britain, Spain, Austria (approximately 4% each), and the Netherlands (3%). Among the new European Union member states, the positions of the Czech Republic and Poland were notable (at a level of approximately 1%), as was that of Hungary (0.5%) and Romania (0.22%).

The import of natural polymers, including chitin and chitosan, from outside the European Union to the Single European Market was marked by a downward tendency from a level of EUR 429 million in 2006 to EUR 384 million in 2007. This accounted for over 60% of the total imports, but representing a slightly downward tendency, from 65% in 2006 to approximately 61% in the year 2007. Among the major suppliers from countries outside the European Union to the European market were those from Singapore, the United States, China, Argentina, Japan, and Brazil (see **Table 9**).

The export of natural polymers, including chitin and chitosan, from the European Union over the years 2006-2007 showed a clear growth trend from a level of EUR 465 million in 2006 to EUR 498 million in 2007. Of this, approximately 98% was from the countries of the "15", while a mere approximately 2% came from the new European Union member states. The main exporter of such products was Sweden, whose share exceeded 40%. France held a share of approximately 10%, then Great Britain and Spain – approximately 8% each, followed by Germany, with a share of approximately 6%-7%, and Austria, with approximately 4%. Among the new European Union member states, the greatest share in the export of natural polymers, as analysed, was held by the Czech Republic, whose share exceeded 1.3%, while Poland barely achieved a 0.08% share in the export of this product.

Table 9. European Union – imports and market volume of natural polymers, including chitin and chitosan; shares of internal and external producers in 2006-2007.

Group of countries or country	Market volume and imports in w mln EUR		Shares in %	
	2006	2007	2006	2007
EU/27 – Market volume	536,04	533,04	100,00	100,00
UE/27 – Total imports	620,7	600,4	100,00	100,00
Including:				
I. Internal imports	192,1	216,5	30,95	36,06
I.A. Main internal producers	164,0	195,5	26,4	32,6
1. Sweden	53,3	69,2	8,58	11,53
2. Germany	30,2	31,5	4,87	5,24
3. United Kingdom	22,1	23,0	3,57	3,83
4. France	17,5	19,3	2,82	3,22
5. Austria	12,0	16,6	1,93	2,76
6. Italy	12,1	14,0	1,94	2,33
7. Netherlands	5,9	11,1	0,95	1,84
8. Belgium	10,9	10,6	1,76	1,77
9. Poland	0,0	0,2	0,01	0,04
II. External imports	428,6	383,9	69,05	63,94
II.A. Main external producers	404,3	367,0	65,1	61,1
1. Singapore	310,0	258,7	49,94	43,09
2. USA	44,8	51,7	7,22	8,61
3. China	24,9	24,1	4,01	4,01
4. Argentina	11,6	17,8	1,88	2,97
5. Japan	5,2	7,5	0,83	1,25
6. Brazil	7,8	7,2	1,26	1,20

Source: Own calculations based on Eurostat and Comtrade-UN data-bases.

Table 10. European Union – market volume of natural polymers, including chitin and chitosan, its structure in 2006-2007.

Group of countries or country	Market volume in mln EUR		Structure of market volume in %	
	2006	2007	2006	2007
EU /27/	536,04	533,04	100,00	100,00
„Old members” – 15	507,16	508,19	94,61	95,34
„New members” – 12	28,88	24,85	5,39	4,66
1. France	322,4	269,2	60,15	50,50
2. Netherlands	6,8	4,8	1,27	0,90
3. Germany	60,2	58,8	11,22	11,03
4. Italy	161,3	91,3	30,10	17,13
5. United Kingdom	3,0	5,0	0,56	0,94
6. Ireland	1,5	2,5	0,29	0,48
7. Denmark	-23,6	-17,8	-4,40	-3,34
8. Greece	0,7	0,9	0,13	0,16
9. Portugal	0,5	0,8	0,10	0,15
10. Spain	1,2	3,6	0,23	0,68
11. Belgium	39,1	130,7	7,30	24,52
12. Luxemburg	0,0	0,0	0,00	0,00
13. Sweden	-139,3	-46,8	-25,98	-8,78
14. Finland	3,1	4,1	0,59	0,76
15. Austria	3,1	1,2	0,58	0,23
16. Malta	0,2	0,1	0,03	0,02
17. Estonia	0,6	0,5	0,12	0,09
18. Latvia	0,1	0,2	0,03	0,04
19. Lithuania	0,3	0,3	0,06	0,06
20. Poland	6,4	5,3	1,19	0,99
21. Czech Republic	9,4	10,2	1,75	1,92
22. Slovakia	7,6	3,1	1,41	0,58
23. Hungary	2,2	2,9	0,41	0,54
24. Romania	1,1	1,3	0,21	0,24
25. Bulgaria	0,4	0,4	0,07	0,08
26. Slovenia	0,6	0,4	0,11	0,07
27. Cyprus	0,0	0,0	0,00	0,00

Source: Own calculations based on Eurostat data-base.

Results obtained from previous tables for the years examined are mirrored in the **market volume of natural polymers, including chitin and chitosan**, presented in **Table 10**. For both groups of European Union countries, this volume was characterised by a slightly downward tendency, from a level of EUR 536 million in 2006 to EUR 533 million in 2007, where there was growth on the part of the countries of the “15” from 94.6% to 95.3% over the years examined, with a fall in the position of the new European Union member states from 5.4% to 4.7% over the same period. The largest share of the market in 2007 was taken by France (50%), Belgium (24%), Italy (17%), and Germany (11%), while in the case of the new member states, it was the Czech Republic (approximately 2%) and Poland (approximately 1%). Due to their very high exports, Sweden and Denmark achieved a negative market volume (for detailed data of the European Union countries see **Table 10**).

Conclusions

This research has demonstrated that from among the product groups analysed over the years examined, the European Union markets for starch, hemicelluloses and cellulose, and natural polymers, including chitin and chitosan, have the greatest development potential. There was only a lack of development potential with respect to the alginate market. The dominant position on all of the markets analysed is occupied by producers from the countries of the “15.” From among the new member states, the market position of Poland is, in most cases, among the most notable from amongst the countries of Central and Eastern Europe, where it is the highest on the European cellulose market (5.8%), followed by hemicellulose (3.6%), starch (approximately 3%) and alginate (approximately 2%), and polymers, including chitin and chitosan (approximately 1%).

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