5. EVALUATION OF DATA FOR ACCEPTABLE DAILY INTAKE AND ACUTE DIETARY INTAKE FOR HUMANS, MAXIMUM RESIDUE LEVELS AND SUPERVISED TRIALS MEDIAN RESIDUE VALUES

5.1 AZOXYSTROBIN (229)

Azoxystrobin was first evaluated for toxicology and residues by the JMPR in 2008. The Meeting derived an ADI of 0–0.2 mg/kg bw per day, decided that an ARfD was unnecessary and concluded that the residue definition for plant and animal commodities for compliance with MRL values and for consumer risk assessment was parent azoxystrobin. The compound was re-evaluated for residues by the JMPR in 2011 and 2012.

Azoxystrobin was listed by the Forty-fourth Session of the CCPR for the review of additional MRLs by the JMPR in 2013. The Meeting received information on GAP and residue supervised trials data on pulses, potatoes, coffee beans, barley, oats and sorghum.

Methods of residue analysis

The Meeting received recovery data on analytical methods for coffee beans. After extraction with ethyl acetate, the residues were determined by LC-MS/MS with an LOQ of 0.01 mg/kg.

Results of supervised residue trials on crops

Most trial designs used replicate plots. If two field samples were taken or results of two replicate plots were submitted, the mean value was calculated. From two trials carried out side-by-side the higher residues was chosen.

Pulses

The 2008 JMPR estimated a maximum residue level for azoxystrobin in soya beans, dry of 0.5 mg/kg and an STMR of 0.06 mg/kg. The 2008 assessment based on the US GAP for soya beans at 6 × 0.28 kg ai/ha and a PHI of 14 days.

The use pattern in Germany for field peas, field beans and lupins is one to two applications at 0.25 kg ai/ha, with a spray interval of 14–28 days and a PHI of 35 days. The GAP in France is two foliar applications applied at 0.2–0.25 kg ai/ha with a spray interval of 14 days and a PHI of 35 days for dry peas (including chickpeas), 42 days for dry beans and lupins and 28 days for lentils.

Eight European trials (2 × UK, 4 × France, 2 × Italy) on dry beans were treated twice with 0.2–0.25 kg ai/ha. One additional French trial was treated with 0.13 + 0.2 kg ai/ha. The residues were in dry beans at PHIs of 26–36 days < 0.01 mg/kg (9).

Twenty trials were conducted on dry peas in the UK and in France matching the French and German GAPs. Azoxystrobin was applied twice at a rate of 0.2–0.25 kg ai/ha with a spray interval of 14 days. Samples of dry pea seed were collected at normal commercial harvest at PHIs of 30–45 days. If results of two replicate plots were submitted, the mean value was calculated. From two trials carried out side-by-side the higher residues were chosen for evaluation. The residues (n=20) were < 0.01 (8), 0.01 (5), 0.015, 0.015, 0.02, 0.025, 0.03, 0.03 and 0.065 mg/kg.

The Meeting estimated a maximum residue level of 0.07 mg/kg and an STMR 0.01 mg/kg for azoxystrobin residues in pulses, dry except soya beans.

Potato

The 2008 JMPR estimated a maximum residue level for azoxystrobin in root and tuber vegetables of 1 mg/kg, an STMR of 0.23 mg/kg and a highest residue of 0.45 mg/kg. The 2008 assessment based on the US GAP for root vegetables at 6 × 0.37 kg ai/ha.

Azoxystrobin is registered in the USA for one post-harvest application at 0.49 g ai/100 kg tubers. Six trials were submitted with one application of 0.44–0.50 g ai/100 kg tubers. Samples were taken directly after treatment. In three trials, stored tubers were analysed also (0–59; 0–61 and 0–231 days after treatment). The maximum residues from samples taken after treatment and after storage were 1.0, 1.5, 2.3, 2.3 and 3.8 mg/kg.

The current Meeting estimated for azoxystrobin residues in potato a maximum residue level of 7 mg/kg Po and an STMR of 2.3 mg/kg. The previous recommendation of 1 mg/kg azoxystrobin for root and tuber vegetables was withdrawn. For root and tuber vegetables, except potatoes, the Meeting confirmed the previous recommendation.

Barley and oats

The 2008 JMPR estimated a maximum residue level for azoxystrobin in barley and oats of 0.5 mg/kg and an STMR of 0.08 mg/kg based on the European GAP and residue data.

Azoxystrobin is registered in the USA in barley and oats as foliar spray with 2 × 0.15 kg ai/ha, a PHI in days for grain was not specified. The recommended use pattern is for a single early season application followed by a single application at 50% to full flag leaf emergence. New residue data were received for barley and oats.

On barley, seven independent supervised trials were conducted. In each trial, azoxystrobin was applied twice at a rate of 0.15 kg ai/ha. The residues in grains were 0.014, 0.019, 0.037, 0.05, 0.19, 0.31 and 0.99 mg/kg.

On oats, twelve supervised trials were submitted treated at a rate of 0.15 kg ai/ha. The residues in grains were 0.013, 0.028, 0.028, 0.028, 0.048, 0.049, 0.053, 0.058, 0.06, 0.12, 0.12 and 0.63 mg/kg.

The Meeting noted that the populations of azoxystrobin residues in grains of barley and oats have similar distributions and can be combined (n=19): 0.013, 0.014, 0.019, 0.028, 0.028, 0.028, 0.037, 0.048, 0.049, 0.05, 0.053, 0.058, 0.06, 0.12, 0.12, 0.19, 0.31, 0.63 and 0.99 mg/kg.

The current Meeting estimated a maximum residue level of 1.5 mg/kg for azoxystrobin residues in barley and oats to replace the previous recommendation (0.5 mg/kg). An STMR value of 0.05 mg/kg for was estimated.

Sorghum

The US GAP for sorghum is 2 × 0.28 kg ai/ha with a PHI of 14 days. Twelve independent supervised trials were conducted. In each trial, azoxystrobin was applied three times at a rate of 0.28 kg ai/ha with a 7-day application interval. The residues in grains were 0.48, 1.3, 1.4, 1.4, 1.7, 1.8, 1.9, 2.2, 2.3, 2.8, 4.5 and 8.0 mg/kg.

The Meeting estimated a maximum residue level of 10 mg/kg and an STMR of 1.85 mg/kg for azoxystrobin residues in sorghum grain.

Coffee beans

The 2011 JMPR estimated for azoxystrobin residues in coffee beans a maximum residue level of 0.02 mg/kg and an STMR of 0.01 mg/kg based on the Brazilian residue data and Brazilian GAP of 2 × 0.15 kg ai/ha (interval 90 days) or 3 × 0.1 kg ai/ha (interval 60 days) and a PHI of 30 days.

The GAP in Columbia is registered as 3 × 0.15 kg ai/ha (interval 45 days) and a PHI of 15 days. Seven new trials have been conducted in Brazil, Colombia and Guatemala in 2010/2011 to support the registered use pattern in Colombia. Azoxystrobin was applied three times at a rate of 0.15 kg ai/ha. The residues in green coffee beans were < 0.01 (4), 0.01, 0.01 and 0.015 mg/kg at a PHI of 14–15 days.

Four further Brazilian trials conducted in 2006/2007 and matching the Colombian GAP were reported by the 2011 JMPR (trials M06024, Roncato, 2008). After application of 3 × 0.15 kg ai/ha and a 14 day PHI, the azoxystrobin residues were < 0.01 mg/kg (4).

In total, the residues of azoxystrobin in green coffee beans matching Columbian GAP were, in rank order (n=11): < 0.01 (8), 0.01, 0.01 and 0.015 mg/kg.

Based on residues data matching Columbian GAP, 0.02 mg/kg were calculated as maximum residue level using the OECD MRL calculator. The Meeting noted that the calculated value is very close to the highest level of 0.015 mg/kg (mean of < 0.01 and 0.02 mg/kg from 2 replicated plots) and proposed rounding up to 0.03 mg/kg.

The current Meeting estimated a maximum residue level of 0.03 mg/kg and an STMR of 0.01 mg/kg for azoxystrobin residues in coffee beans to replace the previous recommendation.

Legume animal feeds

The use pattern in Germany for field peas, field beans and lupins is one to two applications at 0.25 kg ai/ha with a spray interval of 14–28 days. The GAP in France is for dry peas (including chickpeas), dry beans, lentils and lupins two foliar applications at 0.2–0.25 kg ai/ha with an interval of 14 days.

Pea hay or pea fodder (dry)

Twenty trials were conducted on dry peas in the UK and France matching the GAP of France and Germany. Azoxystrobin was applied twice at a rate of 0.2–0.25 kg ai/ha with a spray interval of 14 days. Samples of pea fodder were collected at normal commercial harvest, PHIs of 30–45 days.

Residues found, on fresh weight basis, were (n=20): 0.34, 0.61, 0.62, 0.63, 1.0, 1.4, 1.6, 1.8, 1.8, 2.0, 2.1, 2.3, 3.6, 3.7, 3.8, 3.9, 4.0, 4.8, 7.2 and 18 mg/kg.

The residue values, on dry weight basis, were (88% dry matter): 0.39, 0.69, 0.70, 0.72, 1.1, 1.6, 1.8, 2.0, 2.0, 2.3, 2.4, 2.6, 4.1, 4.2, 4.3, 4.4, 4.5, 5.5, 8.2 and 20 mg/kg.

The Meeting estimated a maximum residue level of 20 mg/kg for azoxystrobin residues in pea hay or fodder (dry) on dry weight basis. The estimated median and highest residue values were 1.9 mg/kg and 18 mg/kg on fresh weight basis or 2.35 mg/kg and 20 mg/kg, respectively on dry weight basis.

Pea vines (green)

Pea vines (green) aren't in international trade and an MRL is not necessary. Nevertheless, the commodity is used as animal feed and the estimation of an STMR and a highest residue values is requested.

In 18 trials conducted on peas in the UK and France matching the GAP of France and Germany for peas (dry), pea vines were sampled. Azoxystrobin was applied twice at a rate of 0.2–0.25 kg ai/ha with a spray interval of 14 days. The highest residue values of pea vines samples collected at PHIs of 2 to 30 days after treatment were selected for the evaluation. The residues were on fresh weight basis (n=18): 0.89, 1.3, 1.4, 1.5, 1.8, 2.6, 3.1, 3.1, 3.3, 3.4, 4.1, 4.5, 4.8, 4.8, 4.9, 5.6, 5.8 and 9.4 mg/kg.

The Meeting estimated a median and a highest residue of 3.35 and 9.4 mg/kg (fresh weight) equivalent to 13.4 and 37.6 mg/kg (25% dry weight basis) for azoxystrobin residues in pea vines.

Straw and fodder (dry) of cereal grains

Based on GAP and residue data for barley, oats, rice, rye, triticale and wheat straw, the 2008 JMPR estimated a maximum residue level for straw and fodder of cereal grains, except maize of 15 mg/kg, an STMR of 1.7 mg/kg and a highest residue value of 11 mg/kg on dry weight basis.

Azoxystrobin is registered in the USA in barley and oats as foliar spray with 2 × 0.15 kg ai/ha and a 7-days PHI for forage and hay. New trials are available for barley straw, oats straw, barley hay and oats hay matching the US GAP. The straw samples were taken at grain harvest 16 – 49 days after treatment. Samples of hay were taken 6 - 7 days after treatment.

The residues in barley straw on fresh weight basis (n=7) were 0.18, 0.28, 0.36, 0.70, 2.6, 3.3 and 3.5 mg/kg; this is equivalent to 0.20, 0.31, 0.40, 0.79, 2.9, 3.7 and 3.9 mg/kg (dry weight, based on 89% dry matter).

The residues in oats straw on fresh weight basis (n=12) were: 0.074, 0.075, 0.088, 0.15, 0.30, 0.31, 0.35, 0.62, 0.70, 0.73, 0.88 and 1.3 mg/kg; this is equivalent to 0.082, 0.083, 0.098, 0.17, 0.33, 0.34, 0.39, 0.69, 0.78, 0.81, 0.98 and 1.4 mg/kg (dry weight, based on 90% dry matter).

The residues in barley hay on fresh weight basis (n=7) were: 0.46, 0.69, 0.76, 0.84, 2.1, 3.2 and 3.7 mg/kg; this is equivalent to 0.52, 0.78, 0.86, 0.95, 2.4, 3.6 and 4.2 mg/kg (dry weight, based on 88% dry matter).

The residues in oats hay on fresh weight basis (n=12) were: 0.20, 0.27, 0.53, 0.66, 0.89, 1.1, 1.3, 2.2, 3.0, 3.1, 3.2 and 3.4 mg/kg; this is equivalent to 0.22, 0.30, 0.59, 0.73, 0.99, 1.2, 1.4, 2.4, 3.3, 3.4, 3.6 and 3.8 mg/kg (dry weight, based on 90% dry matter).

The Meeting noted that the residues in straw and fodder of barley and oats resulting of azoxystrobin treatment according to US GAP were covered by the MRL recommendation of the 2008 JMPR for straw and fodder of cereal grains, except maize of 15 mg/kg (90% dry matter). The estimated median residue value was 1.5 mg/kg (fresh weight) equiv. to 1.7 mg/kg (dry weight) and the highest value 9.9 mg/kg (fresh weight) equiv. to 11 mg/kg (dry weight). A new estimation of a maximum residue level, a median and a highest residue was not necessary. Because residue data on sorghum show higher residues, the commodity "straw and fodder of cereal grains, except maize" should be revised to "Straw and fodder (dry) of cereal grains, except maize and sorghum". The previous recommendation for "Straw and fodder of cereal grains, except maize" should be withdrawn.

The US GAP for sorghum is 2 × 0.28 kg ai/ha with a PHI of 14 days. Twelve trials on sorghum stover, dry, matching the US GAP were submitted. The residues on fresh weight basis (n=12) were: 0.39, 0.53, 0.71, 2.4, 2.6, 3.7, 4.0, 4.5, 4.8, 5.3, 10.5 and 14.5 mg/kg; this is equivalent to 0.44, 0.60, 0.81, 2.7, 2.95, 4.2, 4.5, 5.1, 5.5, 6.0, 12 and 16 mg/kg (dry weight, based on 88% dry matter).

The Meeting estimated maximum residue level of 30 mg/kg for azoxystrobin residues in sorghum straw and fodder, dry on dry weight basis. The estimated median residue value was 3.85 mg/kg (fresh weight) equiv. to 4.35 mg/kg (dry weight) and the highest residue 14.5 mg/kg (fresh weight) equiv. to 16 mg/kg (dry weight).

Cereal forage (green)

Residue data were received for oat and sorghum forage (green). Because these aren't commodities in international trade, MRLs are not necessary. Nevertheless, the commodities are used as animal feed and the estimation of STMRs and highest residue values is requested.

Oats forage (green)

Azoxystrobin is registered in the USA in oats as foliar spray with 2 × 0.15 kg ai/ha and a 7-days PHI for forage and hay. Twelve trials are available for oats forage matching the US GAP. The residues on fresh weight basis (n=12) were: 0.11, 0.20, 0.26, 0.44, 0.52, 0.78, 0.86, 0.95, 1.0, 1.4, 1.6 and 2.0 mg/kg.

The 2008 JMPR estimated a median residue value of 1.7 mg/kg and a highest value of 4.0 mg/kg for oats forage (fresh weight). The current Meeting noted that the residues in oats forage resulting of azoxystrobin treatment according to US GAP are covered by the estimation of the 2008 JMPR.

Sorghum forage (green)

The US GAP for sorghum is 2 × 0.28 kg ai/ha with a PHI of 14 days for grain. Supervised residue trials conducted included residue data for forage from 3 to 21 days after treatment. The residues on fresh weight basis (n=14) were: 0.25, 0.27, 0.29, 0.32, 1.5, 1.5, 1.6, 1.6, 1.7, 1.9, 5.6, 7.2, 11 and 12 mg/kg.

The Meeting estimated a median and a highest residue value of 1.6 and 12 mg/kg (fresh weight) equivalent to 4.6 and 34 mg/kg (35% dry weight basis) for azoxystrobin residues in sorghum forage (green).

Fate of residues during processing

The Meeting received information on the fate of azoxystrobin residues during the processing of potatoes to flakes, chips and wet peel, sorghum to aspirated grain fractions and green coffee to roasted and instant coffee.

The processing factors obtained in the processing studies and estimated STMR-P values are summarized below.

Raw agricultural commodity (RAC)		Processed commodity		
Name	STMR, mg/kg	Name	Processing factor	STMR-P, mg/kg
Potato	2.3	Flakes	< 0.011	0.0253
		Chips	0.012	0.0276
		Wet peel	0.904	2.08
Barley	0.05	Barley malt	0.10 [a]	0.005
		Barley spent grain	0.15 [a]	0.0075
		Beer	0.03 [a]	0.0015
Sorghum	1.85	Aspirated grain fractions	50	92.5
Coffee beans, green	0.01	Roasted coffee beans	0.625	0.006
		Instant coffee	1.06	0.0106

[a] Estimated by JMPR in 2008

Farm animal dietary burden

The 2013 JMPR evaluated residues of azoxystrobin in the following animal feed items: pulses, potato, cereal grains (barley, oats, sorghum), legume animal feeds as well as straw, fodder and forage of cereal grains which are listed in the OECD feeding table.

Estimated maximum and mean dietary burdens of farm animals

Dietary burden calculations based on the feed items evaluated by the JMPR in 2008 and 2013 for beef cattle, dairy cattle, broilers and laying poultry as presented in Annex 6. The calculations were made according to the livestock diets, in the OECD table, from Australia, the EU, Japan and US-Canada. The following table below shows the values calculated by the 2008 JMPR and by the current Meeting.

	Livestock dietary burden, azoxystrobin, ppm of dry matter diet (calculation 2008/2013)							
	Japan		US-Canada		EU		Australia	
	Max	Mean	Max	Mean	Max	Mean	Max	Mean
Beef cattle	-/0.96	-/0.96	34/17	15/12	55/61	19/25	58/72	32/51 [c]
Dairy cattle	-/16.3	-/2.97	33/30	16/12	72[a]/74	27[b]/29	39/45.5	20/20
Poultry – broiler	-/1.4	-/1.4	0.44/1.7	0.44/1.7	0.62/2.2	0.40/1.9	0.59/1.7	0.59/1.7
Poultry – layer	-/1.4	-/1.4	0.44/1.7	0.44/1.7	23[d]/21	9.1[e]/9.5	0.59/1.7	0.59/1.7

[a] Highest maximum beef or dairy cattle burden suitable for MRL estimates for mammalian meat, edible offal and milk

[b] Highest mean dairy cattle burden suitable for STMR estimates for milk

[c] Highest mean beef or dairy cattle burden suitable for STMR estimates for mammalian meat and edible offal

[d] Highest maximum poultry broiler or layer burden suitable for MRL estimates for poultry meat and eggs

[e] Highest mean poultry broiler or layer burden suitable for STMR estimates for poultry meat and eggs

Animal commodity residue levels

The Meeting noted that the new estimation did not result in a significant change of the dietary burdens of farm animals, except the mean burden for beef cattle what increased from 32 ppm in 2008 to 51 ppm in 2013 (factor 1.59).

The 2008 JMPR calculated for a dietary burden of 32 ppm mean residues of 0.013 mg/kg in liver, < 0.01 mg/kg in kidney and 0.01 mg/kg in fat. The estimated STMR values were 0.01 mg/kg for meat (fat) and edible offal from mammals other than marine mammals.

The table below shows the recalculation of the STMR values for meat (fat) and edible offal for mammals, other than marine mammals based on the results of the cattle feeding studies evaluated by the 2008 JMPR and the new dietary burden calculation.

	Mean estimated azoxystrobin concentrations (STMR, mg/kg)			
Beef cattle	Muscle	Liver	Kidney	Fat
Dietary burden (51 ppm)	< 0.01	0.02	< 0.01	0.015
Feeding level [25 ppm]	< 0.01	< 0.01	< 0.01	< 0.01
Feeding level [75 ppm]	< 0.01	0.03	0.01	0.02

The current Meeting calculated mean residues of 0.02 mg/kg in liver and < 0.01 mg/kg in kidney, < 0.01 mg/kg in muscle and 0.015 mg/kg in fat. The estimated STMR values were 0.02 mg/kg for edible offal (mammalian), 001 mg/kg for muscle and 0.015 mg/kg for fat.

The previous MRL recommendations for animal commodities and the STMRs for whole milk, milk fat, poultry meat (fat), poultry edible offal and eggs were maintained.

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Daily Intakes (IEDIs) of azoxystrobin were calculated for the 13 GEMS/Food cluster diets using STMRs and STMR-Ps estimated by the JMPR in 2008, 2011, 2012 and 2013. The results are shown in Annex 3.

The ADI is 0–0.2 mg/kg bw and the calculated IEDIs were 2–10% of the maximum ADI. The Meeting concluded that the long-term intake of residues of azoxystrobin resulting from the uses considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The 2008 Meeting decided that an ARfD for azoxystrobin is unnecessary and concluded that the short-term intake of residues resulting from the use of azoxystrobin is unlikely to present a public health concern.