

Monitoring checklist for Potato with altered starch content – ENV/08/10

Trait or process (WHAT RISK)		Specific monitoring issue identified from an ERA ¹ (WHAT CHARACTER)	Monitoring methods (HOW) ²		Environment e.g. field, natural habitats applicable to CSM/GS ³ (WHERE)	Time for monitoring duration of period, timing applicable to CSM/GS (WHEN)	
			CSM ⁴ (if identified by an ERA)	General Surveillance			
Persistence and Invasiveness & selective advantage or disadvantage	volunteers (in fields)	Monitoring of tuber- and seedborne volunteers/groundkeepers	Floristic volunteer mapping (frequency, abundance, persistence) Gene detection method VDI 4330 Part 5 (Sampling of plant material for the detection of genetically engineered nucleic acids in the environment) VDI 4330 Part 7 (Qualitative methods for the detection of genetically engineered nucleic acids in the environment)	Floristic Volunteer mapping (frequency, abundance, persistence) other survey methods Ecological surveys in wider areas, including: <ul style="list-style-type: none"> Floristic mapping Population & plant community monitoring VDI 4330 Part 9 	In representative environments where the GMP might survive as volunteer, e.g.. agricultural fields and field margins	During the consent period	
	establishment of the GMP ⁵ outside of fields	Monitoring of GMP outside fields	Floristic mapping (presence, abundance, persistence of GMP/potatoes outside the field) Floristic mapping for clearly detectable hybrids or modification of distribution in volunteers or feral distribution Ecological surveys in wider areas, including: <ul style="list-style-type: none"> Floristic mapping Population & plant community monitoring VDI 4330 Part 9 (Vegetation survey) Gene detection method VDI 4330 Part 5 + 7	Habitat monitoring / Land use to identify potential recipient organisms: volunteers and feral plants, in wider areas Gene detection method VDI 4330 Part 5 + 7 Pollen monitoring: Technical pollen sampler VDI 4334 Part 3 Biological pollen sampler VDI 4334 Part 4	Field margins and natural habitats in representative GMO-growing regions,	During the authorisation period, and long term if necessary. During the growing season	
	Spread, persistence and accumulation of GMP in the environment	No relevant monitoring issues other than those accounted for above					
		No relevant monitoring issues other than those accounted for above					
	Presence of GMP products in the environment	No relevant monitoring issues					

¹ ERA – Environmental Risk Assessment

² Kjellson G. and Strandberg, M. (2001) Monitoring and surveillance of genetically modified higher plants. Guidelines for procedures and analysis of environmental effects. Birkhäuser Verlag Basel. 119 pp. VDI-Handbook Biotechnology, Part I: GMO-Monitoring, VDI 4330 (www.vdi.de)

³ GS – General Surveillance

⁴ CSM – Case Specific Monitoring

⁵ GMP = genetically modified plant

Trait or process (WHAT RISK)		Specific monitoring issue identified from an ERA ¹ (WHAT CHARACTER)	Monitoring methods (HOW) ²		Environment e.g. field, natural habitats applicable to CSM/GS ³ (WHERE)	Time for monitoring duration of period, timing applicable to CSM/GS (WHEN)
			CSM ⁴ (if identified by an ERA)	General Surveillance		
Potential for Gene transfer	vertical to crop plants (volunteers, feral), leading to plants with one or several GM traits	Monitoring of volunteers, feral plants (Monitoring of gene flow from 1. field to volunteers 2. from field to feral plants)	Floristic mapping for clearly detectable hybrids or modification of distribution in volunteers or feral distribution Gene detection method VDI 4330 Part 5 + 7 Pollen monitoring: Technical pollen sampler VDI 4334 Part 3 Biological pollen sampler VDI 4334 Part 4 Assessment of flower abortion			
	vertical to wild plants	No relevant monitoring issues. There are no wild relatives in EU.				
	horizontal to micro-organisms in soil, and living on or next to the GMP	No relevant monitoring issues. The traits do not confer a selective advantage, genes are already present and methodology is undeveloped.				
Interaction between GMP and target organisms	reduced abundance and diversity of weeds or development of new weed species	No relevant monitoring issues. There is no target organism.				

Trait or process (WHAT RISK)	Specific monitoring issue identified from an ERA ¹ (WHAT CHARACTER)	Monitoring methods (HOW) ²		Environment e.g. field, natural habitats applicable to CSM/GS ³ (WHERE)	Time for monitoring duration of period, timing applicable to CSM/GS (WHEN)
		CSM ⁴ (if identified by an ERA)	General Surveillance		
resistance development in animals	No relevant monitoring issues. There is no target organism				
Resistance development in plants	No relevant monitoring issues. There is no target organism				
secondary pests	No relevant monitoring issues. There is no target organism				
Interaction between GMP and non-target organisms	Monitoring of abundance of relevant (indicator) species representing a larger set of non-target organisms	Monitoring abundance and if necessary other parameters of selected non-target organisms Assessment of glycalcaloid levels, sugars (mono- and disaccarides), protease inhibitors, lectins in the GMP Assessment of amylopectin:amylose ratios in tubers	Identification of relevant monitoring objectives and parameters which are suitable on non-target organisms in the environment: Surveillance of abundance of relevant (indicator) species representing a larger set of non-target organisms eg: Hypogaeic phytophages Hypogaeic predators Parasitoids Earth worms (Lumbricidae) Nematodes Springtails (Collembola)	In representative fields and field margins where the GMP is grown Studies in natural habitats can be requested after unexpected results from the monitoring of GMP presence outside fields.	During the period of consent

Trait or process (WHAT RISK)	Specific monitoring issue identified from an ERA ¹ (WHAT CHARACTER)	Monitoring methods (HOW) ²		Environment e.g. field, natural habitats applicable to CSM/GS ³ (WHERE)	Time for monitoring duration of period, timing applicable to CSM/GS (WHEN)
		CSM ⁴ (if identified by an ERA)	General Surveillance		
Changes of susceptibility to non-target pests & diseases	Monitoring the damage caused by pests, diseases or pesticide use.	Assessment of glycalcaloid levels, sugars (mono- and disaccarides), protease inhibitors, lectins in the GMP pest and disease surveys	Pest and diseases survey linked to crops practices Pest survey (e.g. collection by knocking them off plants, count of damage by infestation) or survey on pesticide use in the crop	In the fields where the GMP is grown	During cultivation During the period of consent
Other Impacts on habitat diversity and biodiversity	Monitoring changes in diversity, relative frequencies and fitness at different levels of the food chain, other than the specific items listed before Monitoring of relevant indicators		Identification and observation of relevant surveillance programs that provide information relevant to indicators in order to address protection targets. Compilation and evaluation of available data on unusual effects from existing surveillance and monitoring programmes (e.g. bird monitoring programmes, biodiversity monitoring, butterfly monitoring). Depending on the usefulness of existing surveillance programmes the cost effective amendment of relevant indicators or the amendment of existing programs by relevant indicators Large scale observations Biodiversity indicators.	In representative fields and field margins where the GMP is grown, as well as natural habitats Representative and/or relevant bio geographical regions	No time limit

Trait or process (WHAT RISK)		Specific monitoring issue identified from an ERA ¹ (WHAT CHARACTER)	Monitoring methods (HOW) ²		Environment e.g. field, natural habitats applicable to CSM/GS ³ (WHERE)	Time for monitoring duration of period, timing applicable to CSM/GS (WHEN)
			CSM ⁴ (if identified by an ERA)	General Surveillance		
Changes in biogeochemical processes		Monitoring relevant soil functions/parameters	Germination and growth tests, soil parameters as pH, nutrient content, consistency etc. Substrate-induced respiration Fumigation-extraction method Infrared carbon dioxide analyser with flow rate indication/determination of oxygen absorption Total DNA extraction (DGGE) Monitoring for altered root exudations (e.g. Pseudomonas populations; DGGE profiles of 16S and 18S rDNA)	Germination and growth tests, soil parameters as pH, nutrient content, consistency, root exudates etc. Substrate-induced respiration Fumigation-extraction method Infrared carbon dioxide analyser with flow rate indication/determination of oxygen absorption Total DNA extraction (DGGE) Monitoring for altered root exudations (e.g. Pseudomonas populations; DGGE profiles of 16S and 18S rDNA)	In representative fields where the GMP is grown	During the authorisation period, and long term if necessary. During cultivation
	Changes in cultivation practices	Monitor changes in farming practice (e.g. amount and type of pesticides, application of fertilizers, tillage, crop rotation, use of energy)	Pesticide use indicators - Link with Directive 91/414 and Thematic Strategy for Pesticides	Pesticide use indicators - Link with Directive 91/414 and Thematic Strategy for Pesticides Farmer surveys, Questionnaires ⁶		In fields and field margins

⁶ Some experts were of the opinion, that farmer questionnaires might be useful to provide information on agronomic issues. This solely visual method is not appropriate to detect environmental effects on the environment within fields and in the field margins - it does not provide scientifically sound environmental data