Guidelines/Criteria	
Reference:	Guigas C, Pool-Zobel BL, Diehl JF. 1993. Prüfung auf Kombinationseffekte von Quercetin mit den Herbiziden Atrazin, Cyanazin und Gesamprim in Mutagenitätstests. (Combination effects of quercetin with the herbicides atrazine, cyanazine or gesamprim in mutagenicity tests.) Z Ernährungswiss 32:131-138.
***In vitro* Study Type**	HPRT test and SCE in CHO cells (clone K_1-BH_4)
Study Duration	HPRT: Exposure of cell for 2 h, then cells were plated every 2nd day, starting on day 8 treatment with 8-thioguanin for ten days, then detection of mutated cell clones. SCE: exposure for 2 h, then addition of bromdeoxyuridin and colchicin (after 24 h). After 2 further days fixation of cells and further analysis. Both types of experiments also with metabolic activation
Type of Mixture	
Binary	quercetin/gesamprim (formulation of atrazin), quercetin/atrazin, quercetin/cyanazin; all experiments with/without metabolic activation
>2 components	quercetin/atrazin/cyanazin; all experiments with/without metabolic activation
Similar acting or dissimilar	not known
What Mode of Action was investigated?	Gene mutation and sister chromatid exchange in mammalian cells
Parameters/End points Measured	
Target organs/Critical effects	
Pharmacological changes or adverse effects	
In vitro	HPRT mutants, SCE
Individual Components	
Characterisation of individual compounds	
Name, exact chemical name, CAS no.	quercetin, atrazin, cyanazin, Gesamprim (formulation of atrazin with 480g/L). No CAS numbers or purity were given.
Were dose responses established for individual components?	No complete dose responses were established. Only two concentrations were tested at best. The high concentration was not always an effect concentration.
Were no effect levels established?	Yes
Were doses below the NO(A)ELs investigated?	yes, but only in the absence of metabolic activation
Mixtures Investigated	
Number of dose levels	two
How does the mixture make-up compare to individual components? (e.g. low dose) equivalents used?)	mixture-"low": combines the low concentrations of the individual compounds; mixture "high" combines the high concentrations. Endosulfan AB and dieldrin are combined at equimolar concentrations
No. of technical replicates per exposure condition (*in vitro*)	three, one independent repeat of experiment
Observations/Findings	In the absence of metabolic activation, in the HPRT and SCE test the low and high concentration tested were without effect. (NB: gesamprim not tested at the low concentration in the HPRT test). In the presence of metabolic activation the (same) low concentration was a NOEC (NB: gesamprim not tested at the low concentration), the high concentration was an effective concentration in the HPRT test. Again no effect in the SCE test. (NB: quercetin, atrazin, cyanazin, gesamprim not tested at the low concentration for SCE) In the combinations tested in the HPRT test without metabolic activation (quercetin/ gesamprim, quercetin/atrazin, quercetin/cyanazin, quercetin/cyanazin/atrazin at low and high concentrations) only for the binary mixtures at the high dose an effect was seen, which was frequently not significantly different from the effects of the individual compounds. When tested with metabolic activation, (concentration dependent) effects were observed for quercetin/gesamprim (high conc.), quercetin/cyanazin/atrazin (high conc.), quercetin/atrazin and quercetin/cyanazin (at both concentrations). These effects were mostly not significantly different from the effects of the individual compounds. In the combinations tested for SCE (without activation: quercetin/gesamprim, quercetin/atrazin, quercetin/cyanazin, quercetin/cyanazin/atrazin at low and high concentrations, with activation: quercetin/atrazin, quercetin/cyanazin at low and high concentration) no effects were observed.
Overall opinion	
(e.g. sufficient numbers of groups investigated, group sizes adequate, observations reproducible, low dose levels used investigated)	Low number of replicates, low number of concentrations tested, no good selection of the concentration range Partly useful As far as tested: No indication for additivity/synergy in the SCE test No indication for additivity, but rather underadditive effects in the HPRT test