

Evaluation of different mulches for weed control in processing tomato

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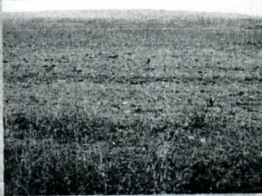
A two-year study testing alternatives to the use of black polyethylene mulch (PE) is presented in this work. PE remaining in the field after the harvest is a waste difficult to manage both in conventional and organic agriculture. During the years 2006 and 2007 ten field trials have been carried out on processing tomato at five different Spanish locations. Different biodegradable alternatives have been tested: two biodegradable plastics (Mater-Bi® and Biofilm®), an oxobiodegradable film material (Enviroplast®), two papers (black Mimcord® and brown recycled Saikraft®), an organic mulch with barley straw, PE and two control treatments (unweeded and manual weeding). Drip irrigation was used in all trials and different mulches irrigated individually to avoid that some treatments could have more water than the others. All films were placed on the soil mechanically but especially the brown paper needed a special adjustment to avoid cracks.

Despite the differences in weed composition (*Amaranthus retroflexus*, *A. blitoides*, *Chenopodium album*, *Convolvulus arvensis*, *Sonchus oleraceus* as main species) and density, in all locations and both years weed control was good or excellent for all mulches excepting the straw. Tomato yield was very similar for all mulch treatments and both years but slightly higher for PE that provided excellent weed control. The two biodegradable plastics and the black paper have been very productive treatments with a very good control. Despite the unsatisfactory weed control (it was difficult to maintain the straw on the soil in some locations due to wind dispersal) straw mulch yielded high in some locations. The biodegradable plastics started their decomposition when the crop covered sufficiently the soil and only slight differences were observed among materials and locations. The buried part of the materials decomposed first for the papers and caused fractures in the aerial part, when strong wind blew, in some locations. The oxobiodegradable plastic had a very irregular behaviour among locations. The buried part of this material did not degrade in any case. In 2007 mean yield was slightly lower for the brown paper probably due to the lower temperatures of the season. The conclusion is that technically viable alternatives exist to substitute the PE mulch in processing tomato but it is necessary to take into account the economic costs of these materials, which are in some cases 3 to 4-fold the price of PE.

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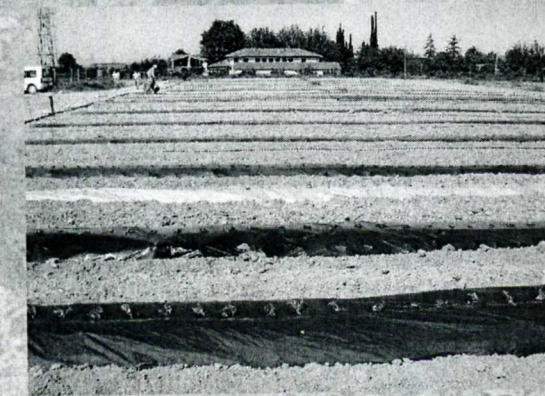
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PE is a waste difficult to manage both in conventional and organic agriculture



Excessive degradation can sometimes happen



Trial in Almudévar. Black paper in front, PE, brown paper, Materbi next.

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Different biodegradable alternatives have been tested: two biodegradable plastics (Mater-Bi® and Biofilm®), an oxobiodegradable film material (Enviroplast®), two papers (black Mimcord® and brown recycled Saikraft®), an organic mulch with barley straw, PE and two control treatments (unweeded and manual weeding).

It was difficult to maintain the straw on the soil in some locations due to wind dispersal. All films were placed on the soil mechanically but especially the brown paper needed a special adjustment to avoid cracks.

Despite the differences in weed composition (*Amaranthus retroflexus*, *A. blitoides*, *Chenopodium album*, *Convolvulus arvensis*, *Sonchus oleraceus* as main species) and density, in all locations and both years weed control was generally good or excellent for all mulches excepting the straw (Table I).

Table I. Weed control (%)

Location/treatment	Almudévar (Huesca)	Valdegón (Logroño)	Ciudad Real	Vilanova de B. (Lleida)	Cadreita (Navarra)	Average
2006						
Control	0 c	0 b	0 c	0 b	0 c	0 f
Manual weeding	85 a	81 a	100 a	80 a	84 b	89 d
Polyethylene	98 a	92 a	100 a	97 a	100 a	99 a
Mater-Bie	94 a	86 a	100 a	92 a	100 a	98 abc
Biofilme	89 a	74 a	99 a	84 a	94 a	93 cd
Enviroplaste	88 a	-	100 a	-	97 a	98 ab
Saikraft®	90 a	93 a	99 a	77 a	95 a	94 bcd
Mimcord®	95 a	77 a	100 a	92 a	96 a	96 abcd
Barley straw	34 b	2 b	98 b	89 a	80 b	70 e
2007						
Control	0 f	0 e	0 c	0 d	0 c	0 f
Manual weeding	87 d	58 cd	99 ab	77 b	24 b	73 d
Polyethylene	100 a	100 a	99 ab	100 a	100 a	100 a
Mater-Bie	99 ab	80 bc	99 ab	95 ab	100 a	97 bc
Biofilme	96 bc	81 bc	99 ab	91 ab	100 a	96 bc
Enviroplaste	99 ab	-	99 ab	-	100 a	100 ab
Saikraft®	92 cd	76 bc	99 ab	95 ab	100 a	95 c
Mimcord®	93 bc	92 ab	100 a	95 ab	100 a	98 bc
Barley straw	43 e	30 d	96 b	22 c	31 b	46 e

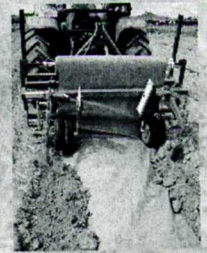
Table II. Tomato yield

Location / Treatment	Almudévar (Huesca)	Valdegón (Logroño)	Ciudad Real	Vilanova de B. (Lleida)	Cadreita (Navarra)	Average
2006						
Control	56 c	66 d	63 b	46 c	76 bc	61 c
Manual weeding	102 ab	94 ab	102 a	80 b	78 abc	91 ab
Polyethylene (PE)	100 ab	100 a	100 a	100 ab	100 ab	100 a
Mater-Bi	112 a	86 c	106 a	111 a	93 abc	101 a
Biofilm	108 a	86 c	98 a	99 ab	81 abc	94 ab
Enviroplast	96 ab	-	88 ab	-	93 abc	92 ab
Saikraft	102 ab	100 a	86 ab	87 ab	74 c	90 ab
Mimcord	103 ab	84 c	96 a	101 ab	102 a	98 a
Barley straw	69 bc	90 bc	82 ab	79 b	85 abc	81 b
Yield tomato in PE (t/ha)	91,4	133,9	123,8	76,2	131,7	111,4
2007						
Control	52 c	77 c	66 d	35 c	22 e	51 c
Manual weeding	112 ab	96 ab	85 bc	73 b	61 d	85 ab
Polyethylene (PE)	100 ab	100 a	100 ab	100 a	100 a	100 ab
Mater-Bi	104 ab	89 ab	92 ab	88 ab	90 abc	92 ab
Biofilm	103 ab	86 bc	103 a	89 ab	93 abc	95 ab
Enviroplast	83 bc	-	94 ab	-	95 ab	91 ab
Saikraft	117 ab	87 bc	72 cd	82 ab	75 cd	87 ab
Mimcord	123 a	93 ab	91 ab	81 ab	76 bcd	93 ab
Barley straw	84 bc	97 ab	85 bc	80 ab	40 e	77 c
Yield tomato in PE (t/ha)	74,4	106,2	94,1	75,8	142,4	98,6

Tomato yield was very similar for all mulch treatments and both years but slightly higher for PE. Despite the unsatisfactory weed control, straw mulch yielded high in some locations (Table II).

The biodegradable plastics started its decomposition when the crop covered sufficiently the soil. The buried part of the materials decomposed first for the papers. The oxobiodegradable plastic had a very irregular behaviour within locations. The buried part of this material didn't degrade in any case.

In 2007 mean yield was slightly lower for the brown paper probably due to the lower temperatures of the season. The two biodegradable plastics and the black paper have been the most productive treatments which have controlled the weeds best.



Putting on the paper



After the harvest. PE in front

The conclusion is that technically viable alternatives exist to substitute the PE mulch in processing tomato but it is necessary to take into account the economic costs of these materials, which are in some cases 3 to 4-fold the price of PE.