**Supplementary Table**. A noncomprehensive summary of research on mechanical and chemical suppression of living mulches for temperate field and vegetable crops.

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| --- | --- | --- | --- | --- | --- |
| **Crop species** | **Mulch species** | **Location** | **Mode of mulch suppressiona** | **Outcome** | **Source** |
| Barley, triticale | Kura clover | Alberta, Canada | Chemical | Glyphosate (0.41 kg ai ha−1) reduced the kura clover proportion of silage, but interspecific competition remained strong. Suppressed clover still contributed to weed control. | (Kosinski et al. 2011) |
| Barley, oat | White clover | United Kingdom | Chemical | Broadcast paraquat (5.6 L ha−1) increased barley yield relative to a band of glyphosate (1.4 kg ai ha−1) in 1 yr. In a second year, this paraquat rate was superior to a lower rate (2.8 L ha−1) or a glyphosate band for both barley and oat. | (Williams and Hayes 1991) |
| Bean (snap) | Cereal rye | Ontario, Canada | Chemical | Very low rates of quizalofop-P-ethyl (up to 18 g ai ha−1) sometimes reduced rye vigor but did not prevent yield losses or enable consistent weed control. | (Buck 2018) |
| Bean (dry), pepper (bell) | Korean lespedeza [*Kummerowia stipulacea* (Maxim.) Makino]; teff, [*Eragrostis tef* (Zucc.) Trotter] | Kentucky, USA | Mechanical | Teff sometimes grew better after conventional tillage than after strip tillage. Mowing two or three times did not suppress the living mulches, but did tend to suppress weeds. | (Hessler 2013) |
| Bean (Italian, green), beet (sugar), cabbage | Perennial ryegrass | Oregon, USA | Mechanical, chemical | Herbicides (sethoxydim, fluazifop) were most effective when applied to vigorously growing grass. When chemical suppression was inadequate, narrower tilled strips resulted in lower yields. Cabbage and sugar beet suffered severe yield losses. | (Rinehold 1987) |
| Beet, cabbage | Oat, perennial ryegrass, rye | New York, USA | Chemical | Low herbicide rates did not successfully suppress living mulches, leading to unacceptable yield losses, but high rates killed them. | (Hughes and Sweet 1979) |
| Beet (sugar) | Oilseed rape, rye | Germany | Chemical | When winter-hardy cover crops were strip-tilled, yield of a glyphosate-resistant crop was higher when suppression included preemergence glyphosate (1.08 kg ai ha−1) than with postemergence-only programs. | (Petersen and Röver 2005) |
| Bok choy (*Brassica rapa* L.) | Perennial ryegrass | Oregon, USA | Mechanical, chemical | Fluazifop-P-butyl (0.17 kg ai ha−1) appeared to be a better management approach than mowing twice, but crop yield did not differ between these treatments. | (Wiles et al. 1989) |
| Broccoli | Annual ryegrass, black oat (*Avena strigosa* Schreb.), rye | Florida, USA | Mechanical | Mowing the living mulches 3 and 7 wk after planting did not suppress them strongly enough to improve broccoli yield. | (Chase and Mbuya 2008) |
| Broccoli | Purslane (common, upright) | Connecticut, USA | Mechanical | Common purslane promoted weed control and good broccoli yields if early-season weed control was supplemented with hand-hoeing or hand-weeding. | (Ellis et al. 2000) |
| Cabbage (white) | Birdsfoot trefoil, red clover, salad burnet, winter rye | Denmark | Mechanical | Pruning of living mulch roots increased cabbage yield, especially when roots were pruned twice. | (Båth et al. 2008) |
| Cabbage | Perennial ryegrass | Oregon, USA | Mechanical, chemical | Mechanical (mowing) and chemical (fluazifop-P-butyl, 0.17 kg ai ha−1) suppression were similar under low water availability, but chemical suppression was superior with more irrigation. | (Graham and Crabtree 1987) |
| Cabbage (white) | Subterranean clover, white clover | Norway | Mechanical | Mowing once or twice did not affect cabbage yield losses, but rototilling 6 wk after cabbage transplanting increased yield relative to the unsuppressed control. | (Brandsæter et al. 1998) |
| Corn (sweet) | Adzuki bean, cereal rye, oilseed radish | Ontario and Quebec, Canada | Chemical | Cereal rye was the most effective living mulch in the absence of herbicides, but the combination of adzuki bean and linuron plus *S*-metolachlor provided good weed control. | (Nurse et al. 2018) |
| Corn | Alfalfa | Minnesota, USA | Chemical | With irrigation, corn grain yields were similar between partial suppression (band or broadcast atrazine) and total suppression (herbicides or tillage). Without irrigation, the band treatment was inferior and total suppression was usually best. | (Eberlein et al. 1992) |
| Corn, soybean | Alfalfa, orchardgrass (*Dactylis glomerata* L.), smooth bromegrass, tall fescue | Illinois, USA | Chemical | Several herbicide treatments preserved up to 60% of a grass sod without unacceptable damage to corn or soybean (tested only with tall fescue) yields. Alfalfa was harder to maintain. | (Elkins et al. 1983) |
| Corn (sweet) | Alfalfa, ladino clover (*Trifolium repens* L.), red clover, white clover | New York, USA | Mechanical, chemical | Chemical suppression or mowing generally improved yield. In corn with white or ladino clover treated with atrazine (0.91 kg ha−1), marketable ear yields were higher than the cultivated control. | (Vrabel et al. 1981) |
| Corn | Birdsfoot trefoil, crownvetch | Pennsylvania, USA | Chemical | Herbicide treatments of atrazine plus simazine (1.12 plus 1.12 kg ai ha−1), atrazine plus cyanazine (1.12 plus 1.12 kg ai ha−1), and atrazine plus penoxalin (1.12 plus 1.68 kg ai ha−1) produced similar corn grain yields, except for a lower yield in birdsfoot trefoil plots with atrazine plus penoxalin. | (Hartwig 1976) |
| Corn | Birdsfoot trefoil, crownvetch, smooth bromegrass | Pennsylvania, USA | Chemical | Across sods, successful treatments tended to include atrazine plus simazine, atrazine plus cyanazine, cyanazine, cyanazine plus dalapon, or cyanazine plus paraquat. | (Hartwig and Hoffman 1975) |
| Corn | Coastal bermudagrass, tall fescue | Georgia, USA | Mechanical, chemical | In corn with coastal bermudagrass, rototilling or suppression with black plastic generally increased grain yield over no-till treatments with maleic hydrazide (4.5 or 9 kg ha−1). | (Adams et al. 1970) |
| Corn | Coastal bermudagrass | South Carolina, USA | Mechanical | Corn yields were similar across tillage treatments (33% to 100% surface tillage). Less aggressive tillage improved the postharvest grass stand. | (Beale and Langdale 1964) |
| Corn | Creeping red fescue (*Festuca rubra* L.), Kentucky bluegrass, white clover | Iowa, USA | Mechanical, chemical | Grain yield was similar to the no-mulch control in Kentucky bluegrass with fall strip tillage, preplant paraquat (0.84 kg ai ha–1), and bands of glyphosate (1.0 kg ai ha–1). | (Wiggans et al. 2012) |
| Corn | Crimson clover | Georgia, USA | Chemical | Paraquat (1.1 kg ha−1) applied in strips covering 60% to 80% of the total area promoted good clover reseeding without corn yield losses. | (Kumwenda et al. 1993) |
| Corn | Crownvetch | Pennsylvania, USA | Chemical | Mulch suppression was often more successful with a younger crownvetch stand or preemergence applications (rather than preplant incorporated). | (Cardina and Hartwig 1980) |
| Corn | Crownvetch | Pennsylvania, USA | Chemical | Treatments such as atrazine plus simazine (1.12 plus 1.12 kg ai ha−1) and atrazine plus cyanazine (1.12 plus 1.12 kg ai ha−1) provided good weed control, mulch suppression, and crop yield. | (Hartwig 1977) |
| Corn | Crownvetch | Pennsylvania, USA | Mechanical | Regardless of tillage treatment (no-till, heavy disk, chisel plow, or moldboard plow), crownvetch had little effect on redroot pigweed control or crop yield. | (Hartwig and Loughran 1989) |
| Corn | Crownvetch | New York, USA | Chemical | Glyphosate plus atrazine plus 2,4-D (0.56 plus 4.48 plus 0.56 kg ha−1) gave the highest corn yield but fall groundcover was low. Other treatments damaged crownvetch less severely. | (Linscott and Hagin 1975) |
| Corn | Crownvetch, alone or with annual rye | Pennsylvania, USA | Mechanical | Corn yield (with crownvetch, summed over rye treatments) tended to be higher under minimum tillage than no-tillage or conventional tillage. | (Loughran and Hartwig 1987) |
| Corn | Hairy vetch | Ohio, USA | Mechanical, chemical | When corn was planted at the vetch early bud stage (late April), vetch caused substantial yield losses if unsuppressed or partially suppressed by rolling, chopping, or mowing. Glyphosate (2.8 kg ai ha−l) reduced mulch-crop competition but also reduced weed control. | (Hoffman et al. 1993) |
| Corn | Hairy vetch | Mississippi, USA | Chemical | Killing a band of hairy vetch before planting did not substantially reduce yield losses, but postemergence glyphosate applications (band and especially broadcast, 0.84 kg ae ha−1 applied twice) did improve yield. | (Reddy and Koger 2004) |
| Corn | Hairy vetch | Maryland, USA | Mechanical, chemical | Mowing did not provide full-season mulch suppression or weed control. When herbicides were applied, vetch did not have consistent effects on weed control or corn yield. | (Teasdale 1993) |
| Corn | Italian ryegrass, white clover | Switzerland | Mechanical, chemical | Dry matter yield of corn grown with mechanically or chemically regulated clover was higher than yield with mechanically regulated grass under low nitrogen. | (Garibay et al. 1997) |
| Corn | Kentucky bluegrass, orchardgrass, smooth bromegrass, tall fescue, timothy (*Phleum pratense* L.) | West Virginia, USA | Chemical | At one of two sites, a higher rate of atrazine (3.4 kg ha−1) was superior to a lower rate (1.7 kg ha−1) for an orchardgrass, tall fescue, or bromegrass mulch. At the other site, corn yield was sometimes higher with the lower rate (2.2 vs. 4.5 kg ha−1). | (Bennett et al. 1976) |
| Corn | Kentucky bluegrass, tall fescue | Illinois, USA | Chemical | Treatments including maleic hydrazide, fluridamid, mefluidide, glyphosate, glyphosate plus atrazine, metolachlor, metolachlor plus atrazine, and dalapon successfully balanced erosion control and yield protection, especially when paraquat was also applied in bands. | (Elkins et al. 1979) |
| Corn | Kura clover | Wisconsin, USA | Chemical | Herbicide-resistant corn yields were higher when clover was strongly suppressed with preplant glyphosate plus dicamba (1.66 plus 0.14 kg ae ha−1) than with the glyphosate only. Both treatments also included herbicides for band kill and postemergence applications. | (Affeldt et al. 2004) |
| Corn | Kura clover | Minnesota, USA | Mechanical, chemical | Rotary zone tillage increased corn yields relative to shank tillage or herbicide band kill in one of two years. | (Dobbratz et al. 2019) |
| Corn | Kura clover | Minnesota, USA | Mechanical, chemical | A treatment combining shank and rotary zone tillage increased available nitrogen and reduced kura clover encroachment into rows relative to bands of glyphosate (4 kg ae ha−1). | (Ginakes et al. 2018) |
| Corn | Kura clover | Colorado, USA | Mechanical, chemical | Corn grain yield was higher under strip tillage than no-till with herbicide bands in one of two years. Kura clover production did not vary with suppression treatment. | (Pearson et al. 2014) |
| Corn | Kura clover | Wisconsin, USA | Chemical | In one of two years, applying herbicide bands to kura clover increased crop yield relative to a broadcast suppression treatment. | (Zemenchik et al. 2000) |
| Corn | Orchardgrass | West Virginia, USA | Chemical | Orchardgrass was suppressed by a lower rate of atrazine plus paraquat (2.2 plus 0.5 kg ai ha−1) and killed by a higher rate (4.5 plus 0.5 kg ai ha−1). | (Bennett et al. 1973) |
| Corn | Pensacola bahiagrass (*Paspalum notatum* Alain ex Flüggé) | Florida, USA | Chemical | Combinations of paraquat plus residual herbicides permitted excessive interspecific competition. Glyphosate plus residual herbicides provided stronger grass suppression. | (Robertson et al. 1976) |
| Corn | Smooth bromegrass | Nebraska, USA | Chemical | Chemical suppression (paraquat, 2.3 L ha−1) improved yield relative to an unsuppressed treatment. | (Klocke et al. 1989) |
| Corn | Tall fescue | Georgia, USA | Chemical | Atrazine plus paraquat (2.2 plus 0.28 kg ha−1) killed the sod, whereas atrazine alone (2.2 kg ha−1) suppressed it but permitted regrowth. | (Carreker et al. 1972) |
| Corn | Tall fescue | Georgia, USA | Chemical | Planting corn in a 0.41-m strip of killed tall fescue resulted in higher corn yield than planting in a 0.20-m strip. | (Wilkinson et al. 1987) |
| Corn (sweet) | White clover | Oregon, USA | Mechanical, chemical | Atrazine (0.84 kg ai ha−1) provided better clover suppression for the establishment year than the growth regulator PP333 (paclobutrazol, 0.84 kg ai ha-) or mowing. | (Cooper 1985) |
| Corn (sweet) | White clover | New York, USA | Mechanical | Rototilling protected corn yield more effectively than mowing. Rototilling worked best when performed 2 wk rather than 4 or 6 wk after corn emergence. | (Grubinger and Minotti 1990) |
| Corn | White clover and mixed grasses | Nova Scotia, Canada | Mechanical, chemical | Corn yield tended to be higher with combined rototilling and herbicide bands than with either treatment alone or straw mulch. | (Martin et al. 1999) |
| Corn (sweet) | White clover | New York, USA | Mechanical | Corn yield was similar between no-till and strip-till treatments with clover. Glyphosate bands in both clover treatments allowed weed establishment after the first year. | (Mohler 1991) |
| Corn (sweet) | White clover | Oregon, USA | Mechanical, chemical | Atrazine at 1.4 kg ai ha−1 effectively suppressed fall-planted clover in its second year, whereas atrazine at 0.84 kg ai ha−1 or mowing did not prevent corn yield losses. | (Peterman 1985) |
| Corn | White clover | Georgia, USA | Chemical | Applying glyphosate plus dicamba (1.12 plus 1.20 kg ai ha−1) in a 20-cm band was preferable to a 40-cm band because the narrower band allowed greater clover persistence and regrowth. | (Sanders et al. 2017) |
| Eggplant | Crimson clover | Maryland, USA | Mechanical | Eggplant yield was reduced by crimson clover in the first year but not the second. This difference may have reflected the switch from mowing (first year) to strip tillage (second) but did not appear to be a competition effect. | (Hooks et al. 2013) |
| Onion | Barley | North Dakota, USA | Chemical | Onion yield losses were largely eliminated when barley was terminated before reaching 18 cm. | (Greenland 2000) |
| Soybean | Kentucky bluegrass, tall fescue | Illinois, USA | Chemical | Herbicide treatments including paraquat (0.6 kg ha−1), paraquat plus metolachlor (0.6 plus 3.4 to 4.5 kg ha−1), paraquat plus mefluidide (0.6 plus 0.6 kg ha−1), and glyphosate plus metribuzin (1.1 plus 1.1 kg ha−1) provided a good balance between soybean yield and grass regrowth. | (Elkins et al. 1982) |
| Soybean | Kura clover | Wisconsin, USA | Chemical | Soybean yield tended to increase with more glyphosate applications (0.75 kg ae ha−1, one to four times), although this trend was generally not significant. | (Pedersen et al. 2009) |
| Tomato | Sunnhemp | New York, USA | Chemical | Tomato yield and weed control were both satisfactory under two-step treatments involving a residual herbicide followed by a herbicide with greater postemergence activity, both applied postemergence at reduced rates. | (Bhaskar et al. 2020) |
| Wheat (winter) | White clover | Sweden | Chemical | Autumn applications of diflufenican plus isoprutoron were superior to a spring application of isoprutoron only in a third consecutive crop of winter wheat. | (Bergkvist 2003) |
| Wheat (winter) | White clover | Denmark | Mechanical | Widening rototilled strips in white clover (from 7 cm to 14 cm) reduced interspecific competition and increased crop yield. | (Thorsted et al. 2006a) |
| Wheat (winter) | White clover | Denmark | Mechanical | Suppressing white clover with a weed brusher reduced wheat yield losses. When brushed two or three times, the intercropped plots could achieve higher yields than a wheat monocrop. | (Thorsted et al. 2006b) |
| Zucchini squash | Sunnhemp | Maryland, USA | Mechanical | Yield losses were smaller in a year in which sunnhemp was flail mowed to 20 cm before transplanting than in years in which sunnhemp was regularly clipped to 45 cm. | (Hinds et al. 2016) |
| Zucchini squash | Winter rye | Illinois, USA | Chemical | The living mulch may have contributed to weed control, but all rye treatments resulted in zucchini stunting due to allelopathy. There was no interaction between herbicide and cover crop treatment on zucchini yield. | (Walters and Young 2008) |

aWe list only treatments implemented as factors (including a binary yes/no factor), not treatments common to all plots.

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