

NOSB NATIONAL LIST FILE CHECKLIST

CROPS

MATERIAL NAME: #12 Newspaper Mulch



NOSB Database Form



References



MSDS (or equivalent)



TAP Reviews from: Sam Cotner, Eric
Sideman, and Joseph
Heckman

**NOSB/NATIONAL LIST
COMMENT FORM
CROPS**

Material Name: #12 Newspaper Mulch

Please use this page to write down comments, questions, and your anticipated vote(s).

COMMENTS/QUESTIONS:

1. In my opinion, this material is:
 Synthetic Non-synthetic.

2. This material should be placed on the proposed National List as:
 Prohibited Natural Allowed Synthetic.

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: Sept. 11, 1995

Name of Material: Newspaper Mulch

Reviewer Name: Sam Cohen

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

If synthetic, how is the material made? (please answer here if our database form is blank)

This material should be added to the National List as:

Synthetic Allowed Prohibited Natural

or, Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

No

Please comment on the accuracy of the information in the file:

Any additional comments? (attachments welcomed)

Do you have a commercial interest in this material? Yes; No

Signature Sam Cohen

Date Sept 6, 1995

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: Sept 2, 1995

Name of Material: Newspaper Mulch

Reviewer Name: Eric Sideman

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

Synthetic

If synthetic, how is the material made? (please answer here if our database form is blank)

This material should be added to the National List as:

Synthetic Allowed Prohibited Natural

or, Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

Yes - If the material is to be shredded caution must be used because of health risks associated with polycyclic aromatic hydrocarbons in the dust. [see #7 on other side] the cellulose dust is the greatest risk. Please comment on the accuracy of the information in the file: D.K.

Any additional comments? (attachments welcomed)

There were a number of concerns with the use of newspaper in agriculture, but recent studies have satisfied me as to the safety of it. I have attached cover sheets of two publications that are worth reading and surely should be on file. They address the issues of heavy metals and polycyclic aromatic hydrocarbons.

Do you have a commercial interest in this material? Yes; No

Signature Eric Sideman Date 8/24/95

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

- (1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

The attached articles both say that there was no accumulation of heavy metals or polycyclic aromatic hydrocarbons.

- (2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

The polycyclic aromatic hydrocarbons are very dangerous and in high concentration in the paper, but they break down very quickly during aerobic decomposition and do not accumulate in plants or soil.

- (3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

Environmental contamination during manufacturing is a sure thing. Our rivers in Maine are a mess from the paper industry, but the alternative of post-consumer use will not affect this.

- (4) the effect of the substance on human health;

The greatest risk associated with newspaper use is the dust from shredding. Appropriate masks should be worn. The risks associated with organic chemicals and heavy metals are negligible after aerobic decomposition.

- (5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

Using newspaper as bedding has been shown to be safe for livestock. There is no buildup of salts or heavy metals in soil and no evidence of plant uptake.

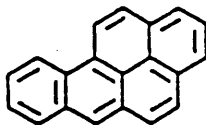
- (6) the alternatives to using the substance in terms of practices or other available materials; and

Straw makes a better match with much higher CEC and great soil building characteristics, but it is expensive and newspaper is cheap or free.

- (7) its compatibility with a system of sustainable agriculture.

It fits very well into a community level recycling effort. Within the farm system it is an environmentally friendly way to keep down weeds or bed

POLYCYCLIC AROMATIC HYDROCARBONS (PAH)
IN PAPER BEDDING:
COMPOSTABILITY, HEALTH RISKS AND
BIO-DEGRADATION



Benzo [a] pyrene

Prepared for
The Maine Waste Management Agency
Augusta Maine

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WOODS END RESEARCH LABORATORY
Mount Vernon, Maine

April 1991
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Kader, A.A. 1985. Modified atmospheres and low-pressure systems during transport and storage, p. 58-64. In: Postharvest technology of horticultural crops. Coop. Ext., Univ. of California. Div. of Agr. and Natural Sci. Special Publ. 3311.

Kader, A.A., D. Zagory, and E.L. Kerbel. 1989. Modified atmosphere packaging of fruits and vegetables. Crit. Rev. Food Sci. Nutr. 28:1-30.

Kawada, K. 1981. Use of polymeric films to extend postharvest life and improve marketability of fruits and vegetables, p. 87-99. In: D.G. Richardson and M. Meheriuk (eds.). Controlled atmospheres for storage and transport of perishable agricultural commodities. Symposium Serica rapid California procedure in commercial controlled atmosphere facilities.

Rizvi, S.S. 1988. Controlled and modified atmosphere packaging of fruits and vegetables. New York's Food and Life Sci. Quarterly 18:19-23.

Salunkhe, D.K. and M.T. Wu. 1973. Effects of low oxygen atmosphere storage on ripening and associated changes of tomato fruits. J. Amer. Soc. Hort. Sci. 98:12-14.

Smith, S., J. Geeson, and J. Stow. 1987. Production of modified atmospheres in deciduous fruits by the use of films and coatings. HortScience 22:772-777.

Comparisons of Shredded Newspaper and Wheat Straw as Crop Mulches

David A. Munn¹

Additional index words. recycled paper, corn, tomatoes, soybeans

Summary. This study compared shredded newspaper, wheat straw (*Triticum aestivum* L.) mulch, and bare soil as surface treatments under sweet corn [*Zea mays* L., var. Saccharata (Surt.)], field corn (*Z. mays* L.), soybean [*Glycine max* (L.) Merr.], and processing tomatoes (*Lycopersicon esculentum* Mill.). In a replicated study with limited mechanical weed control and no chemical weed control in 1990, and no weed control except for the mulch in 1991, the mulches provided a cooler, moister soil environment and effective suppression of most annual and some perennial weeds. The rank order of yields was the same for all three crops in 1990: newspaper mulch > wheat straw mulch > bare soil cover. In 1991 the rank order for yield was: soybeans/newspaper mulch > wheat straw > bare soil ($P < 0.01$); field corn/newspaper mulch > bare soil > wheat straw ($P > 0.10$). The straw and newspaper mulches had similar effects on yield, weed control, soil moisture, and soil temperature. They were significantly different from bare soil in many crop and mulch combinations studied. A brief evaluation of high rates of newspaper mulch showed no apparent growth problems for corn and soybeans and no heavy metal accumulation in the soil. Since shredded newspaper from community recycling programs is available at low cost (\$40-50/ton vs. \$90-100/ton for straw), this material is an attractive soil-management alternative in horticultural and agronomic production systems.

¹Associate Professor.

The Ohio State University Agricultural Technical Institute, Wooster, OH 44691.

Mulches are widely used in the production of horticultural crops (Ashworth and Harrison, 1983; Barland, 1990; Robinson, 1988), and crop residue is an important component of conservation tillage systems (Wilhelm et al., 1986). Many communities are under pressure to recycle metal, glass, and paper products to reduce landfill volume and conserve resources (Glen, 1990). Large supplies of newspaper are created in many areas without facilities for repulping this product. The question arises as to whether agriculture could use recycled newspaper in creative and economically feasible ways. Shredded newspaper has been used satisfactorily as bedding for dairy cows (Temple, 1989, 1990). Carter and Johnson (1988) found flat sheets (four thicknesses) of newspaper to be useful in mulching eggplant (*Solanum melongena* L.) but less effective than pine straw (*Pinus* sp. L.) or black plastic mulch at conserving soil moisture and suppressing weeds.

This study was designed to compare the crop mulch value of shredded newspaper with wheat straw at similar application rates and to determine if high rates of newspaper mulch are detrimental to plants or soils.

In 1990 an experiment was conducted to compare bare soil, wheat straw mulch, and shredded newspaper mulch on the yields of sweet corn, soybean, and processing tomatoes. In 1991 the study was repeated with field corn and soybeans. Mulch cover was expected to affect soil moisture, temperature, and weed control and, therefore, plant yields (Barland, 1990).

Materials and Methods

1990 Experiment. In 1990 the experimental site was prepared by four passes with a rear-tine tiller to create a level and loose seedbed free of weeds and trash. The soil used was Glenford silt loam (Aeric Ochraqualfs), a deep, moderately well-drained soil formed on Wisconsin-age glacial lake beds and on terraces along streams. The land in sweet corn and soybeans had been in sweet corn the year before. Because soil test P and K levels were very high (Table 1), starter fertilizer was not used with the sweet corn and soybeans. 'White-N-Gold' sweet corn was planted in 30-inch (0.76 m) rows 24 feet (7.3 m) long on 1 June 1990. Fourteen rows were planted to provide

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Are there any use restrictions or limitations that should be placed on this material on the National List?

Please comment on the accuracy of the information in the file:

Any additional comments? (attachments welcomed)

See attachment on survey of heavy metal concentration in various newspapers.

Results show heavy metal concentrations are generally

Do you have a commercial interest in this material? Yes; No *Low*

Signature Joseph R. Hedeman Date ~~Sept~~ Aug 23, 1995

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

(1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

(2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

newspaper is generally lower in heavy metal concentrations than rye straws (see attachment). Colorado newspaper has relatively high concentrations of copper.

(3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

(4) the effect of the substance on human health;

(5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

newspaper has a very high carbon to nitrogen ratio. This will result in immobilization of some available soil nitrogen where the newspaper mulch is in contact with the soil.

(6) the alternatives to using the substance in terms of practices or other available materials; and

There are of course many alternatives to newspaper mulch but it is relatively cheap and very effective as a mulch.

(7) its compatibility with a system of sustainable agriculture.

Using Newspapers in Agriculture

Recycling programs in many areas have created large supplies of newspaper without facilities for repulping the product. Agriculture, however, is finding some creative and economically feasible ways to utilize this waste product. Shredded newspaper is being used satisfactorily as bedding material for livestock and as a mulch in horticultural and agronomic production systems. Although concern has been raised about the presence of heavy metals in newspaper, tests of various types of paper that were conducted in other states indicate that this is not a problem. The heavy metals of concern were present at very low levels and were well within safe limits - even if the newspaper bedding was consumed by the animals.

A recent test of heavy metals in newspapers that circulate in New Jersey supports the findings of earlier research. We collected samples of newsprint for our study from the following newspapers: Star Ledger, Burlington County Times, Home News, Rutgers Review, The Courier News, Philadelphia Inquirer, Daily News, New York Times, USA Today, The New Jersey Farmer, The Daily Targum, and Greenprint. Prior to analysis, the newspapers were grouped into two categories: black and white only newsprint and mixed color sections of newspaper. The samples were ground in a Wiley mill to pass a 1.0 mm screen, dry ashed, dissolved in acid and analyzed by a direct current plasma instrument. We also analyzed rye straw by the same procedure for comparison with the elemental concentrations found in newspapers. Rye straw samples were collected from eight different farms from Burlington and Monmouth counties.

The average concentrations and ranges of various elements found in newspapers and rye straw are shown in Table 2. The concentration of copper in colored newspaper is relatively high compared to black and white newspaper or rye straw, but it is well below the maximum allowable limit (1200 ppm Cu) that has been set for sewage sludge used in agriculture. Average concentrations of cadmium, lead, nickel, chromium, cobalt, zinc, molybdenum, manganese and iron were found to be lower in newspapers than in rye straw. This indicates that heavy metal

Table 2. Elemental Analysis of Newspaper and Rye Straw Samples Collected from New Jersey.

Element	Newspaper, Black and White			Newspaper, Mixed Colors			Rye Straw		
	Avg.	Low	High	Avg.	Low	High	Avg.	Low	High
	-----%-----								
N	0.11	0.09	0.13	0.11	0.08	0.13	0.71	0.3	1.3
P	0.004	0.002	0.006	0.02	0.001	0.70	0.17	0.04	0.26
K	0.02	0.01	0.03	0.02	0.01	0.03	1.72	1.03	2.74
Ca	0.08	0.02	0.17	0.06	0.01	0.11	0.17	0.11	0.22
Mg	0.02	0.005	0.03	0.02	0.005	0.03	0.08	0.03	0.11
	----- mg/kg or ppm -----								
Na	568	77	1038	520	131	835	82	46	119
B	11	4	29	4	1	10	7	3	14
Cu	2.8	1.1	6.7	57.0	4.5	156.5	4.3	1.5	6.6
Fe	44	24	66	36	7	51	127	25	416
Mn	47	22	78	41	16	80	54	18	87
Mo	0.2	0.1	0.3	0.6	0.1	1.5	0.9	0.5	1.7
Zn	20	3	87	6	1	11	23	13	39
Cd	0.5	0.1	0.8	0.5	0.3	0.7	0.8	0.6	1.1
Co	0.6	0.2	1.3	0.8	0.3	1.2	1.2	0.6	1.9
Cr	0.9	0.3	1.9	0.8	0.2	1.0	4.2	1.1	10.9
Ni	0.5	0.3	0.8	1.2	0.1	2.3	4.0	1.5	6.2
Pb	0.7	0.2	1.6	0.5	0.1	1.7	1.2	0.3	2.5
Al	552	30	1170	1692	62	1556	70	17	209

concentrations in newspapers tend to be lower than normal agricultural background levels. Sodium and aluminum were found to be present at considerably higher concentrations in newspaper than in rye straw but these elements should not present a problem for use of newspapers in agriculture. As might be expected, newspaper contains only very small amounts of nitrogen, phosphorus, potassium, calcium and magnesium. Newspaper used as a mulch or applied to soil as bedding contained in animal manures would provide little benefit as a source of plant nutrients, but will contribute organic matter for the build-up of soil humus.

THE SOIL PROFILE

Newspaper and Wheat Straw Compared as Crop Mulches

A study published in *Hort Technology* compared the crop mulch value of shredded newspaper with wheat straw or bare soil. The materials were applied at 2-5 tons/acre as surface treatments under established sweet corn, field corn, soybean, and processing tomatoes. Shredded newspaper more effectively suppressed weeds than did wheat straw. In addition to providing the best weed control, newspaper is free of weed seed. Both newspaper and wheat straw

mulches similarly reduced early summer soil temperatures and increased soil water content relative to bare soil. Both mulches generally increased crop yields over bare soil, but crop performance with newspaper was generally better than with wheat straw. The mulch covers were very heavy at the time of application, but broke down over the growing season and did not interfere with fall tillage or soil preparation for a winter cover crop.

References

Munn, D.A. 1992. Comparisons of Shredded Newspaper and Wheat Straw as Crop Mulches. Hort Technology 2:361-366.

Temple, G. 1990. Newsprint gets farmer and livestock okay. Biocycle 37:60-63.

Survey of Soil Samples

A national survey of the soil, plant, water, and animal waste samples analyzed for nutrient management was conducted for the years 1988-91. Copies of the survey report, with details for each state, are available from: Owen Plank, Hoke Smith Bldg., University of Georgia, Athens, GA, 30602.

Data in the report shows that soil analysis laboratories in the US tested 2.0 million soil samples from farms and 0.7 million nonfarm samples in 1991. The farm samples represent 150 acres of harvested cropland per soil sample.

In New Jersey, Rutgers Soils Laboratory tested about 1,000 samples from farms and about 9,000 nonfarm samples in 1992. The samples from farms represent about 400 acres of harvested New Jersey cropland per sample.

New Fact Sheets Available from Rutgers Cooperative Extension

FS 675 Nutrient Sources For Growing Plants by the Organic Method

FS 663 Impact of De-icing Salt on Roadside Vegetation

THE SOIL PROFILE

Identification

Common Name	Newspaper Mulch	Chemical Name	
Other Names			
Code #: CAS		Code #: Other	
N. L. Category	Synthetic Allowed	MSDS	n/a

Chemistry

Family

Composition Ink: alkali-refined soybean oil (or safflower, cottonseed, and canola oils), a hydrocarbon resin.
Paper: wood pulp

Properties

How Made

Polymerization of vegetable oils for inks. Newspaper is made by pulping wood by cooking wood chips under pressure in a solution of sulfurous acid and either magnesium, sodium, or ammonium bisulfite.

Use/Action

Type of Use Crops

Use(s) mulch. Production aid.

Action smothers weeds.

Combinations

Status

OFPA production aid

N. L. Restriction

EPA, FDA, etc N/A

Safety Guidelines

Registration N/A

Historical status

International status

Directions

State Differences

OFPA Criteria

2119(m)1: chemical interactions

2119(m)2: toxicity & persistence

Newspaper breaks down readily into carbonaceous material.

2119(m)3: manufacture & disposal consequences

The paper manufacturing industry has many environmental hazards as well as regulations to follow. The hazards include the effects of logging and replanting pulp species on the land, and the pollution from effluent, burning wastes, or air contaminations that the factories give off. The production of inks, even if oil derived, will have some manufacturing consequences.

2119(m)4: effect on human health

2119(m)5: agroecosystem biology

2119(m)6: alternatives to substance

Straw or hay mulch, living mulch, dust mulch, hoeing, mechanical cultivation.

2119(m)7: Is it compatible?

References

Erhan, S.Z.; Bagby, M.O.; Cunningham, H.W. Vegetable oil-based printing inks. J-Am-Oil-Chem-Soc. Champaign, Ill.: The Society. Mar 1992. Vol. 69 (3) p. 251-256.

Erhan, S.Z.; Bagby, M.O. Polymerization of vegetable oils and their uses in printing inks. J-Am-Oil-Chem-Soc. Champaign, IL: AOCS Press. Nov 1994. Vol. 71 (11) p. 1223-1226.

Shane, B.S.; Netosh-Dicker, C.A.; Ebel, J.G. Jr., et al. Toxicological evaluation of milk from lactating dairy cows following consumptions of newsprint. J-agric-food-chem. Washington, D.C.: American Chemical Society. Feb. 1993. Vol. 41 (2) p. 240-245.