STRAW MULCH INCREASES YIELD AND GRADE OF FURROW IRRIGATED ONIONS

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Summary

Straw mulch has been proven to increase yield and grade of furrow irrigated onions. The purpose of this work was to summarize the results of five different field trials where straw mulch was applied to the bottom of the irrigation furrows and to examine the possible causes of the yield and grade improvements. Furrow mulching with wheat straw was shown to keep the soil wetter which may benefit the onions. Onions with straw mulch may have higher populations of predatory insects that could feed on thrips.

Introduction

Straw mulch has been used to reduce erosion and increase water infiltration in Malheur County for several years. Manual straw mulching is very laborious and time consuming, but there are machines on the market that work very effectively. Straw mulch is applied mechanically to the bottom of the furrow, where it impedes the progress of the water. By slowing the water, erosion is reduced and the larger wetted area in the furrow bottom improves infiltration.

Methods

Identification of thrips predators. Onion fields were examined in 1997 for the presence of predatory insects that could feed on thrips. Sweeps identified the minute pirate bug and lacewing larva. It is not yet known whether these or other predators can control thrips or if their populations are enhanced by straw mulch.

Preparation of wheat straw. To prepare straw suitable for mechanical application, wheat from a weed free field was cut during wheat harvest with a cylinder type combine. Wheat straw was cut at 8 to 10 in length, baled, and stored dry. Straw was applied to the furrow bottoms prior to the first irrigation, and/or at layby depending on the field using a mechanical straw applicator (Hobson Mulching System, Hobson Manufacturing Inc., Keiser, Oregon). Our experience indicates that routine onion cultivations are nearly impossible with 800 lb/ac of straw in the irrigation furrows. Splitting the application of straw mulch into two lighter applications allowed for early season cultivation. The early season cultivation is important for weed control.

Onion yield and grade in three commercial fields. Mechanically applied straw was tested in replicated plots in three commercial onion fields with typical quarter mile irrigation runs. Soils were silt loam with 4, 1, and 1.5 percent slope respectively in 1988, 1990, and 1991. Wheat straw was prepared as described above and applied at 730 kg ha^{-1} in a single operation using a mechanical straw applicator after layby cultivations and herbicides each year. In commercial fields, furrows used for irrigation both have and lack a history of wheel-traffic compaction. Consequently straw was applied both to wheel-traffic furrows and to nonwheel-traffic furrows. Onion yield and grade were observed from 10, 4, and 10 replicates in the three trials respectively. At harvest, onions were harvested separately from along wheel-traffic furrows and nonwheel-traffic furrows with and without mechanically applied straw. Onions were graded by size and defects.

Onion yield and grade at the Malheur Experiment Station. Two experiments were conducted at the Malheur Experiment Station on a Nyssa silt loam with a 3 percent slope. The straw mulch was applied as split applications before the first irrigation and at layby totaling 800 lb/ac in 1991 and as a single layby application of 563 lb/acre in 1995. In both of the trials at the Malheur Experiment Station, water inflow, outflow, and sediment loss was measured in furrows with and without straw mulch. Soil water potential was measured with Watermark Soil Moisture Sensors (Irrometer Company, Inc., Riverside, CA) and the amount of infiltration was calculated. Onion yields were evaluated and onions were graded by size and defects out of storage.

Results

Mechanically applied straw at layby increased yields of onions in commercial fields in two of three years. Furrow mulching increased onion yield and grade significantly above the check treatment both years at the experiment station (Tables 1 and 2). Costs of straw application were much lower than the value of the increased onion yields in these fields.

Causes of increased onion yield with straw mulch. Straw mulching increased water infiltration and the soil remained wetter when the furrows were mulched with straw. Onion yield and grade are known to respond sensitively to soil water potential, so the increased onion yields probably were due to increased soil moisture. Straw mulch affects factors other than soil water. Since runoff was reduced, less sediment and nutrients were lost from the field. Thrips pressure was low in these fields. The unproven possibility exists of decreasing thrips populations through enhanced thrips predators with the application of straw. Straw mulch also can moderate soil temperature, improving the soil environment for root growth.

Conclusions

Furrow mulching was associated with a large increase in total yield, a large improvement in onion grade, and occasionally a modest increase in decomposition in comparison to the onions grown without furrow mulching. The increases in yield and grade were due to onions attaining larger diameters.

Table 1. Market grade and total yield of onions with and without furrow mulching in a field with three percent slope, Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1991.

Erosion control treatment	Yield by market grade					Total yield
	Small <2 1/2 in	Medium2 1/4 - 3 in	Jumbo 3-4 in	Colossal > 4 in	Total marketable	
	----------cwt/acre----------					
None	26	218	122	10	350	376
Strawed	13	179	345	80	604	617
LSD (0.05)	4	NS	39	19	65	59

Table 2. Response of onion yield and grade after storage to furrow mulching to reduce erosion in a field with three percent slope, Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

Erosion control treatment	Yield by market grade							Total yield
	Rot	Number 2	Small <2 1/4 in	Medium 2 1/4 - 3 in	Jumbo 3 - 4 in	Colossal > 4 in	Total marketable	
	----------cwt/acre----------							
None	8.3	0.2	45.3	154.8	160.9	0.1	315.8	369.6
Strawed	73.1	17.1	14.2	69.2	491.7	38.3	599.2	703.6
LSD (0.05)	44.3	9.3	10.8	28.3	55.8	11.8	68.5	55.4