

1974 Report
COMPREHENSIVE RESEARCH ON RICE
December 10, 1974

PROJECT NUMBER AND TITLE: RM-10. Residue Utilization-Packaging Investigations of Rice Straw and Hulls as Feed for Livestock and Fiber for Paper-Making or Construction Materials.

PROJECT LEADER: John B. Dobie

PERSONNEL: W. N. Garrett, Animal Nutritionist
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R. G. Curley, Extension Agricultural Engineer
Cooperator: Howard Walker, USDA Laboratory, Albany

OBJECTIVES:

To continue cooperation with animal scientists in producing packaged rations as need for feeding trials.

To cooperate with the USDA Laboratory, Albany, on packaging treated straw.

WORK IN PROGRESS:

The feeding trial which will be reported more specifically in the next section, has not been completed due to inconclusive results. It is planned that this work will be repeated during the winter of 1975-76, since limitation of animals and facilities in the Animal Science Department will not permit the work to be done sooner.

A cooperative project is being continued on treatment of rice straw to improve its digestibility and subsequent feeding trials with treated and untreated straw. This work is not being funded under RM-10 but has a close relationship to future work that should be undertaken. Principal investigators in this cooperative study are Dr. W. N. Garrett and Howard Walker, listed under personnel of this project. The results have been favorable and additional straw is currently being treated for additional feeding trials. From these studies, it appears that some future feeding of animals should be planned, using sodium hydroxide in its dual role for straw treatment and as a bonding agent for cubing the straw. Methods presently used include treating and pelleting followed by crumbling the pellets and mixing the crumbles into the ration for feeding. Cubing would be a less expensive process if acceptable.

EXPERIMENTS COMPLETED:

A feeding trial was performed starting in February 1974, and running for 112 days, attempting to determine the effect of particle size of rice straw on animal performance. A previous feeding trial had shown best results when the straw was ground and pelleted. The purpose of the 1974 trial was to determine whether this effect was due to the fine grinding required for pelleting or to feeding in pellet form. Four particle size categories were tested. Each treatment was compressed into 1 1/4 inch-square cubes. Nine

cattle were individually fed the cubed straw, plus 3 pounds per day of a supplement containing 49% cottonseed meal, 49% ground barley, 1% gypsum, 2.5% dicalcium phosphate, and 2.5% trace mineral salt. A summary of the results are given below:

Treatment for particle size	Hammermill screen size			Shredded
	3/16 inch	5/8 inch	1 1/4 inch	4x5 screen
Initial wt. of animals	502	481	506	489
Average daily gain - lb.	1.08	0.86	1.14	0.91
Feed Consumption				
(rice straw only) lb/day	14.1	12.1	13.1	12.0
Supplement - lb/day	3.0	3.0	3.0	3.0
Modulus of fineness in cubed rice straw	1.85	2.25	2.71	3.0

The results of this trial were inconclusive, particularly due to the wide variation between animals within treatments. The differences in modulus of fineness in the straw between treatments was not as great as expected, primarily because of additional size reduction that occurred due to cubing of the coarser material.

Because of the inconclusiveness of results and the importance of the variable of particle size to ruminant performance, this experiment should be repeated.

WORK PLANNED:

The desirable effect of the addition of sodium hydroxide as a treatment just prior to pelleting has been demonstrated in the cooperative feeding trials with the USDA Laboratory, Albany. This material has proven effective as a binder for cubing in work performed in Oregon on ryegrass straw. However, information is needed regarding the effect of sodium hydroxide on digestibility of rice straw packaged at cubing pressure and temperature. Samples will be prepared in the single cube press through a range of pressures and temperatures, and tested by laboratory procedures for the effect on digestibility. Depending on the laboratory results, additional feeding trials with treated cubed straw may be indicated.

A repeat of the feeding trial on effect of particle size of rice straw for feeding is planned for the winter of 1975-76.

MAJOR ACCOMPLISHMENTS:

In previous years, criteria were developed by which rice straw can be packaged into cubes to improve its physical characteristics as livestock feed. These criteria were tested in actual production of cubes for feeding. Rice straw was also pelleted with no problem other than those associated with particle size reduction. Economic studies showed that a system could be developed which would be marginally feasible in producing cubed rations for cattle, containing major proportions of rice straw. Reports containing this information have been published.

Recent studies have added to the experience in physical conditioning of rice straw for feed and also to knowledge concerning animal performance when rations containing rice straw are fed.

IMMEDIATELY APPLICABLE RESEARCH RESULTS:

In addition to information reported previously, the results of the feeding trial on effect of particle size on animal performance indicate good gains for overwintering cattle on all treatments. However, non-significant differences between treatments indicate further testing should be done to determine if cubed, coarsely-ground straw provides optimum results.

Treating rice straw with sodium hydroxide or ammonia improves digestibility for ruminant animals.

EVALUATION OF PROJECT:

This project has shown that untreated rice straw is marginal, economically, as livestock feed, but that such use is feasible if other considerations such as feed shortages or exceptionally high forage prices become important. Hydrolization of the straw can increase its value, but optimum treatment and packaging methods for best utilization by animals have not been established.

The objectives as originally set forth have been accomplished. The project should be continued through 1975 with the limited funds requested to permit cooperation with the Animal Science Department in feeding work with straw to finalize the optimum conditions for use of rice straw as feed.

PUBLICATIONS OR REPORTS:

Waelti, H., and J. B. Dobie. 1973. Cubability of rice straw as affected by various binders. Transactions of the ASAE 16(2):380-383.

Dobie, J. B., P. S. Parsons, and R. G. Curley. 1973. Systems for handling and utilizing rice straw. Transactions of the ASAE 16(3):533-536.

Dobie, J. B., and E. J. Carnegie. 1973. Dry versus liquid binders for cubing straw. Transactions of the ASAE 16(3):508-509.

Hull, J. L., J. B. Dobie, and J. G. Morris. 1974. Processing roughages for wintering steer calves. California Agriculture 28(2):10-11.