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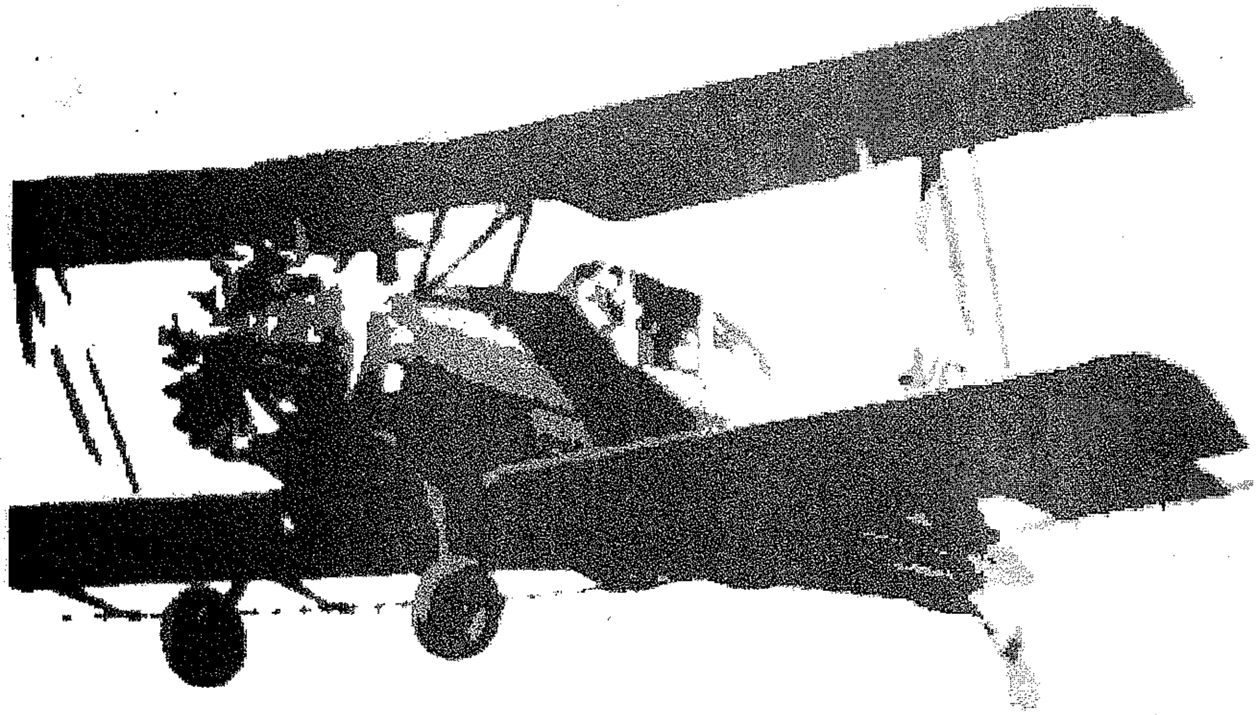

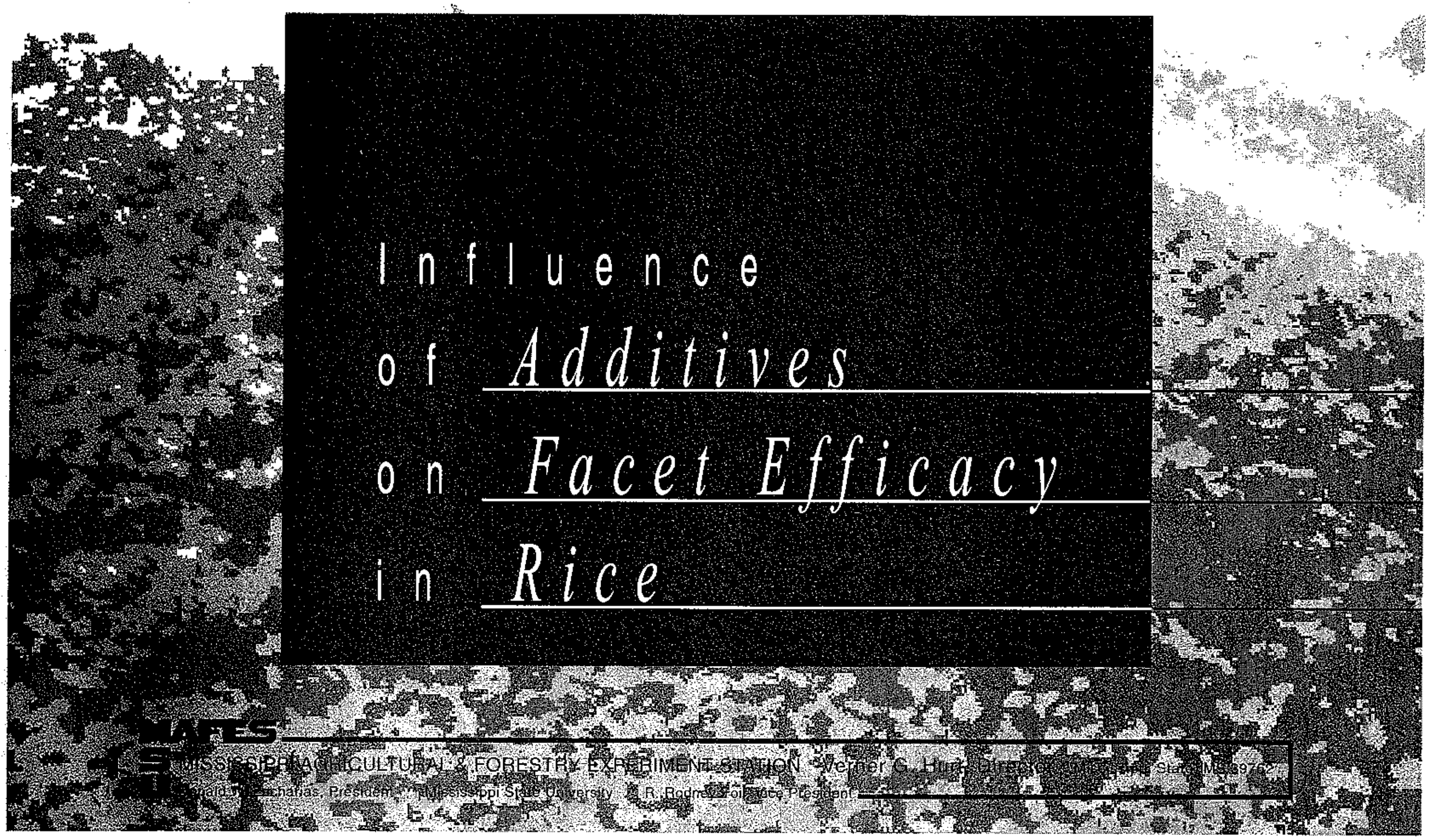

Influence of *Additives* on *Facet Efficacy* in *Rice*

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Introduction

Facet® is a new herbicide registered for use in U.S. rice in 1992. It has a wide range of application timings from preemergence to postemergence (9, 10). It may be applied preemergence to dry soil (PRE-D), preemergence to moist soil (PRE-M) or early and late postemergence.

Facet is effective as a PPI treatment but it is not yet registered for that application. It is efficacious on broadleaf and grass weeds commonly found in rice including barnyardgrass, morningglory, and hemp sesbania.[1]

The chemical structure of Facet is related to natural auxins, but it has an additional ethylene-stimulating effect in grass weeds (3). The main entrance into plants is through roots, epicotyl, and hypocotyl from application to soil surface, but leaf uptake also occurs from postemergence application. The Facet label[1] recommends the use of a crop oil concentrate to improve leaf uptake, but it does not specify a type.

Use of additives in combination with postemergence herbicide application can alter physicochemical properties of the spray solutions (2). This may influence spray retention, droplet spread on leaf surface and penetration. Gillespie et al. (2) assumed that translocation was also influenced, but effects on penetration may be predominant (7).

Main groups of additives are classified as nonionic surfactants on the basis of polyoxyethylene (POE) or crop oil concentrates (COC) (12). Crop oil concentrates consist of either petroleum oil (MOC) or vegetable oil (POC). Recent research showed that vegetable oil can perform as well as petroleum oil concentrates (6). Methyl esters of vegetable oil were better than the parent oils and sometimes even better than petroleum oil concentrates (7, 11, 13); however, Beckett (1) found no relation between different physicochemical data and performance of nonionic surfactants and crop oil concentrate.

The Weed Control Guidelines for Mississippi[2] listed about 120 different brand names of surfactants and surfactants/oil blends in 1993. Thus, performance of the same additive with different herbicides makes decisions about proper tank mixtures difficult. DuPont published a list of "approved adjuvants"[3] to limit mixtures with unsatisfactory results.

The objective of research summarized in this bulletin was to determine Facet efficacy with different additives common in the U.S. pesticide market.

Previous studies showed outstanding efficacy of the Facet plus BCH 864, an experimental additive (8). Facet at 0.25 lb ai/A is the lowest recommended rate for early postemergence application, and in tank mixture with BCH 864, weed control was greater than 95% for barnyardgrass and 99% for morningglory (10). Although much research has been done with BCH 864, it will not be available to the U.S. rice producer. Thus, work was initiated to evaluate additives that are currently available for use with Facet.

Materials and Methods

Experiments were conducted at the Delta Branch Experiment Station near Stoneville, MS, in 1991 and 1992. Soil type was a Sharkey clay with 1.2% organic matter content and pH 7.4. Plots 8 feet by 15 feet were overseeded with barnyardgrass, hemp sesbania, and pitted morningglory prior to final land preparation and again immediately prior to seeding rice. 'Lemont' rice was seeded about 0.75-inch deep into dry soil in rows 9 inches apart at a seeding rate of 90 lb/A. Standard southern U.S. rice production practices were used in land preparation and fertilizer application.[4]

A randomized complete block design with four replications was used. Treatments included postemergence application of Facet at 0.25 lb ai/A in combination with 14 different additives at recommended rates (Table 1). Spray solutions were applied

[1]Facet Herbicide-User Guide. BASF Corp., Agricultural Products, P. O. Box B528, Research Triangle Park, NC 27709.

[2]1993 Weed Control Guidelines for Mississippi. Mississippi Cooperative Extension Service, Mississippi State University. Publication 1532.

[3]Du Pont Agricultural Bulletin: Approved adjuvant list – 1993. E. I. DuPont de Nemours and Company, Agricultural Products, Wilmington, Delaware 19898, H-42790.

[4]Miller, T. C. 1992. Mississippi Rice Growers' Guide. Mississippi Cooperastive Extension Service, Mississippi State University.

Table 1. Classification of additives used in presented studies and application rates.

		Effect[1]				
Additive	Group	A	B	C	D	Rate
BCH 864	POE	not specified				3 pt/A
Dash	POE	not specified				0.5% v/v
Induce POE	POE	X	X			0.5% v/v
Kinetic	POE	X	X	X		0.25% v/v
Latron CS-7	POE	X				0.5% v/v
LI-700	POE	X	X			0.5% v/v
Penetrator	POE	X	X	X	X	1 qt/A
Triton AG 98	POE	X				0.5% v/v
X-77 Spreader	POE	X				0.5% v/v
Agridex	MOC	X				1 qt/A
Competitor	POC					0.25% v/v
Penetrator Plus	MOC	X				1 qt/A
Superpost	MOC					0.25% v/v
Prime Oil II	POC	X	X			1 qt/A

[1] = spreader sticker; B = wetting agent; C = penetrating agent; D = buffering activity

with a backpack sprayer, which delivered 10 GPA at a pressure of 38 PSI. Rice injury and weed control were determined by estimating visually on a scale of 0 to 100, with 0 indicating no injury or weed control and 100 indicating dead plants. Yield was determined in 1992 by harvesting entire plots with a small plot combine and correcting total yield to 12% moisture. Yield was not determined in 1991 because of severe lodging in plots with poor weed control.

All data were subjected to analysis of variance procedure. There was no year-by-treatment interaction so data were pooled over years and means of injury and weed control were separated by Fisher's Least Significant Differences (LSD) Test at the 0.05 probability level.

Results and Discussion

BCH 864 has been developed as an experimental additive for use with Facet in rice, but is not available for commercial use. Weed control was not as effective in this study as in earlier research and resulted in 85% and 84% barnyardgrass and pitted morningglory control, respectively. Even with postemergence application, the main effect of Facet comes from root uptake (5). This can be influenced by lack of water or excess water.

In 1991, the study area was flushed shortly after application and, in 1992, precipitation of nearly 8 inches within 36 hours after application occurred. Influence of water application timing on efficacy of Facet was shown by Street[5] indicating reduced weed control with early water supply after preemergence application to saturated soil. When additional water was applied 1 day after treatment, efficacy was reduced nearly 20%. Under these circumstances, results of this study should emphasize the influence of additives on leaf uptake because soil activity was reduced.

Previous studies with major semidwarf rice varieties showed their excellent tolerance to Facet and injury was not influenced by any of the additives in this study. Ratings 14 days after treatment showed differences in weed control between various additives. Barnyardgrass control with Facet was >80% only when applied with BCH 864 and Primeoil II®. However, several additives performed as well as Primeoil II (Figure 1). In this study, use of Induce®, Dash®, Superpost®, and Competitor® resulted in less barnyardgrass control than Primeoil II 14 days after treatment. In combination with Dash or Superpost, Facet efficacy was 24% and 22% less, respectively, than with BCH 864.

In general, additives had less effect on Facet efficacy on pitted morningglory, which supports the report by Landez et al. (4) that Facet without an adjuvant is efficacious against morningglory (Figure 1). In mixture with Dash or Superpost, pitted morningglory control with Facet was not as good as with Facet plus BCH 864. These two additives along with Kinetic®, Competitor, and Induce, resulted in efficacy ratings lower than 80%.

Under normal conditions, Facet activity is slower than contact herbicides such as propanil. This is due to the soil uptake of Facet and its mode of action in the target plants. In this study no major changes in barnyardgrass control occurred within 14 days after the first rating. Only the mixture with X-77 increased efficacy to >80%. All other treatments equaled the first ratings (Figure 2).

Rice yield was determined only in 1992, and yields generally reflected weed control (Figure 3). No weed control resulted in yield loss up to 95% compared to Facet plus BCH 864. Thus, high weed density in this study made small differences in weed control responsible for yield loss. Barnyardgrass control with Facet plus LI-700 was only 12% less than Facet plus BCH 864, yet yields were 2,400 lb/A less. In combination with Induce, yield reduction was 2,370 lb/A compared to Facet plus BCH 864. Of the additives evaluated in this study, LI-700, Induce, Dash, Superpost, Kinetic, and Competitor resulted in reduced yields as compared to BCH 864.

Results of this 2-year study show that even additives of the same group (POE, MOC, or POC) influenced Facet efficacy differently. Thus, results may depend on the quality of the crop oil concentrate specified since differences occurred within a class of compounds. Although a COC is specified on the Facet label, AG

[5]Street, J. E. 1989. 1988 Annual Report – Rice Weed Control. Mississippi Agricultural and Forestry Experiment Station, Mississippi State University. Information Bulletin 141.

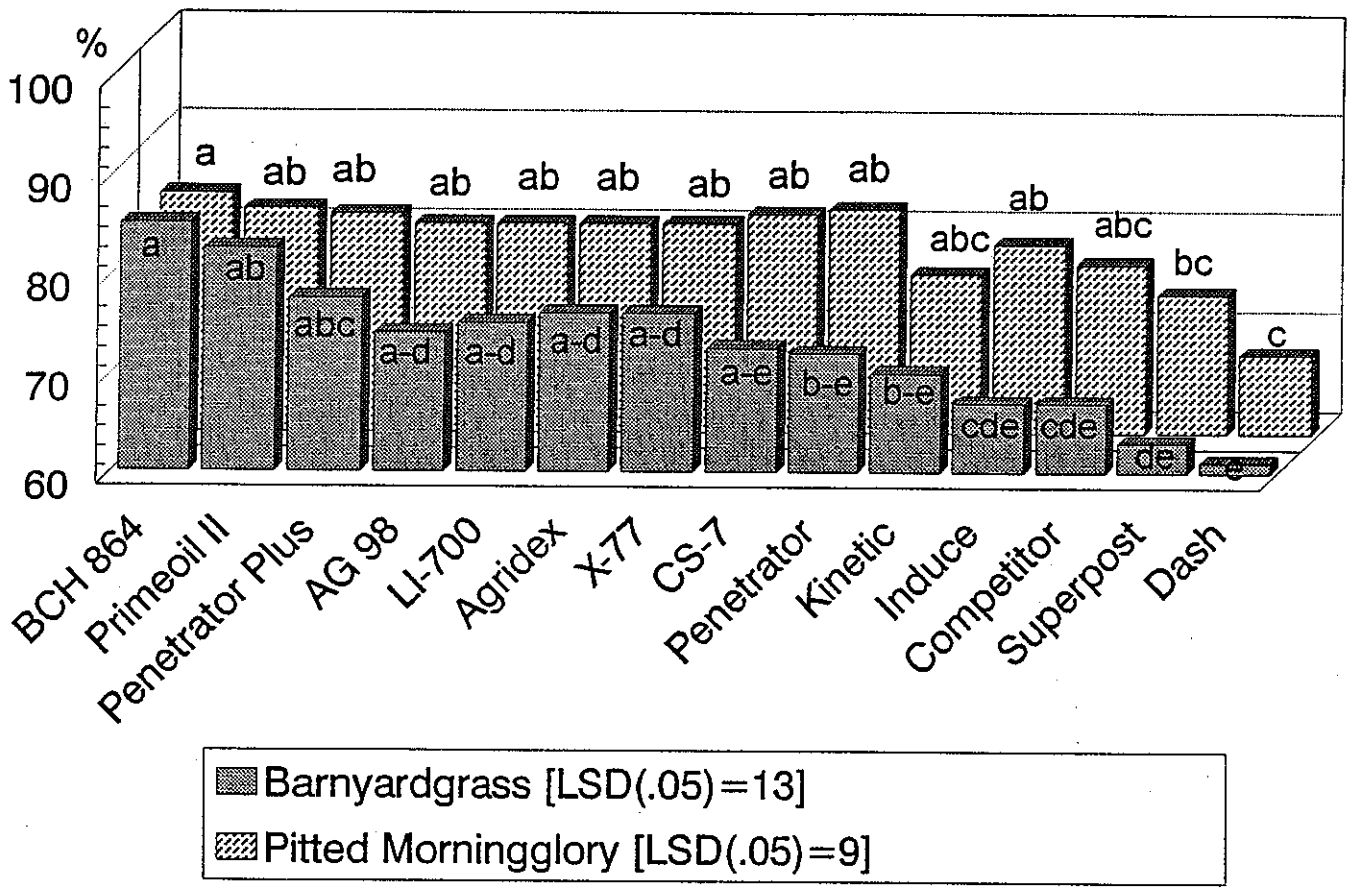

Figure 1. Influence of additives on Facet efficacy 14 days after treatment.

98, a nonionic surfactant of polyoxyethylene basis, performed as well as crop oil concentrates. Although some additives did not perform as well as others under the conditions of this study, this does not indicate that they would not perform under other environmental conditions. What it does indicate is that specific combinations should be evaluated prior to use.

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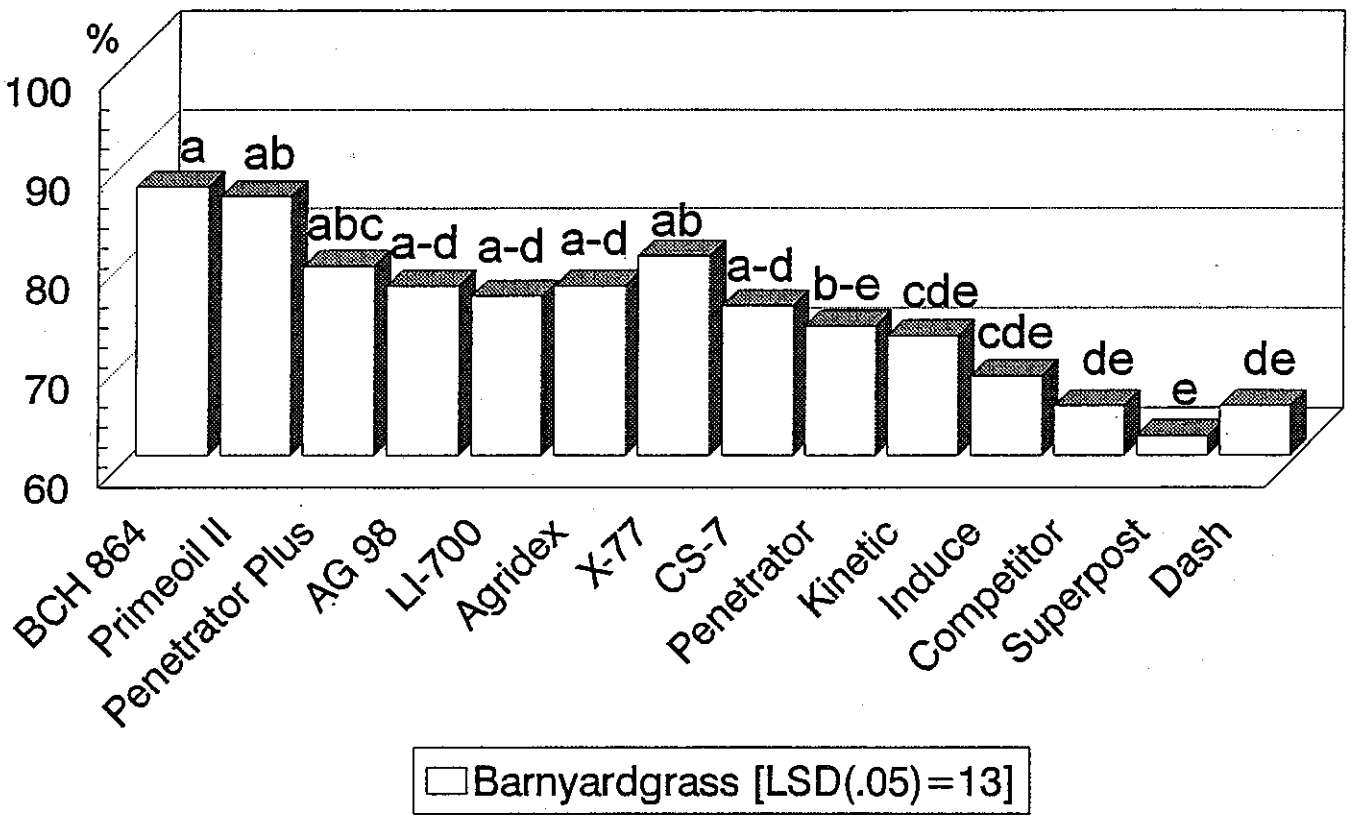

Figure 2. Influence of additives on Facet efficacy 28 days after treatment.

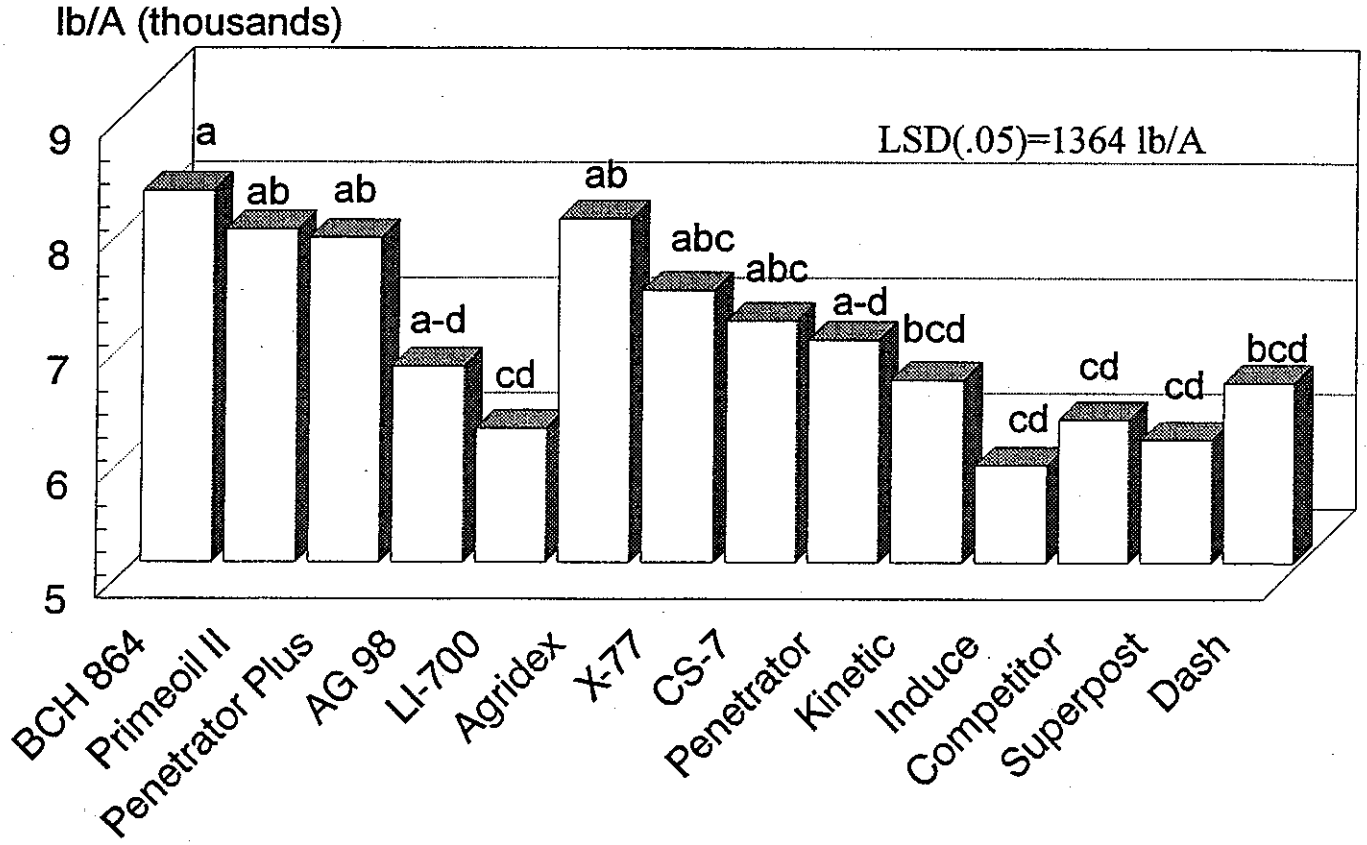

Figure 3. Influence of Facet application with additives on rice yield in 1992.

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