THE POTENTIAL FOR BENZOBICYCLON FOR CONTROL OF COMMON RICE WEEDS

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INTRODUCTION

Benzobicyclon is an HPPD inhibiting herbicide that is currently marketed for use in Japan (McKnight et al. 2014a). Typical symptoms on susceptible weed species following herbicide application include bleached white plant tissue followed by necrosis and plant death (McKnight et al. 2014b; 2014c). Field studies were conducted with benzobicyclon in the 2013 growing season at the LSU AgCenter Rice Research Station near Crowley, Louisiana and glasshouse studies were established at the Louisiana State University campus in Baton Rouge, Louisiana. The scope of this research was to evaluate the activity of benzobicyclon on common Mid-South rice weed species.

MATERIALS AND METHODS

In a field study, benzobicyclon was applied into a 1.5 m by 5.2 plots containing a single randomly place 91-cm diameter by 30-cm deep galvanized ring per plot. The rice was under permanent flooded conditions, the rings were used to contain herbicide and prevent dilution. Herbicide treatments consisted of benzobicyclon applied at nine different rates: 31, 62, 123, 185, 246, 492, 738, 984, and 1230 g a.i. ha^{-1}. The applications were made with a CO2 backpack sprayer calibrated to deliver 140L/ha when ducksalad [*Heteranthera limosa* (Sw.) Willd.] was at the spoon growth stage. Other weeds present in the plot area were Indian jointvetch (*Aeschynomene indica* L.), barnyardgrass (*Echinochloa crus-galli* L.), and yellow nutsedge (*Cyperus esculentus* L.). Visual control ratings were collected 10, 21, 35, and 49 days after treatment (DAT).

In a separate glasshouse study, 3- to 6-leaf yellow nutsedge plants were transplanted into 38-liter plastic containers designed to hold flood depths of 5 and 10-cm. Plants were allowed to establish and a flood was introduced 5 days before treatments were applied. Five rates of benzobicyclon were applied: 246, 492, 984, 1476, and 1968 g a.i. ha^{-1}. Treatments were applied with a CO_2 backpack sprayer calibrated to deliver 140 L ha^{-1}. Visual control ratings were collected 14, 21, and 28 DAT. At the conclusion of the study, 28 DAT, the plants were harvested. Data collected on the harvested plants included height, total fresh weight, above ground weight, root weight, and tuber counts.

RESULTS AND DISCUSSION

In the field study, ducksalad control was greater than 85% when treated with benzobicyclon at rates of 123 g a.i. ha^{-1} and higher at 21, 35, and 49 DAT (Table 1). At 49 DAT, ducksalad treated with the 62 g a.i. ha^{-1} was controlled less than ducksalad treated with the higher rates of benzobicyclon; however, control was still greater than 90% indicating that ducksalad is susceptible to benzobicyclon at low rates. The highest observed barnyardgrass control was observed at 49 DAT when barnyardgrass was treated with the highest rate, 1230 g/ha. Indian jointvetch and yellow nutsedge control were similar as the highest control was observed when treated with the 1230 g a.i. ha^{-1} rate, 49 DAT. Control at 49 DAT for Indian jointvetch and yellow nutsedge was 70 and 75%, respectively. Yellow nutsedge control at 10 indicating that several weeks are necessary for full activity of benzobicyclon to occur.

In the glasshouse study, the highest yellow nutsedge control of 79% was observed when treated with the 984 g a.i. ha^{-1} rate of benzobicyclon under a 10-cm flood, 28 DAT. The tallest plants at the conclusion of the study were observed in the nontreated containers.

Heights of the nontreated plants in the 5 and 10-cm floods were 66 and 59-cm, respectively, and were taller than any yellow nutsedge receiving benzobicyclon treatment in either flood depth. Nontreated plants in both flood depths also had more tubers than any plants receiving benzobicyclon at 28 DAT (Table 2).

Table 1. Control of Indian jointvetch, yellow nutsedge, barnyardgrass, and ducksalad at 49 DAT under flooded conditions with benzobicyclon applied at different rates.

Benzobicyclon	Indian jointvetch	Yellow nutsedge	Barnyardgrass	Ducksalad
g a.i. ha^{-1}	#			
31	0 d	9 ef	5 fg	48 c
62	3 d	11 ef	6 efg	94 b
123	5 d	23 de	16 def	98 a
185	5 d	21 de	18 de	96 ab
246	8 d	30 cd	25 d	98 a
492	30 c	44 bc	45 c	99 a
738	39 bc	48 b	75 ab	99 a
984	40 b	51 b	64 b	99 a
1230	70 a	75 a	81 a	99 a

Table 2. Mean yellow nutsedge tuber count following benzobicyclon treatment under two different flood depths.

Benzobicyclon Rate	5–cm Flood Depth	10–cm Flood Depth
g a.i. ha^{-1}	#	
Nontreated	6.1 a	5.4 a
246	2.0 b	0.7 b
492	1.0 b	0.0 b
984	2.0 b	0.2 b
1476	0.6 b	0.1 b
1968	0.1 b	0.0 b

CONCLUSION

Benzobicyclon exhibits activity on common weeds found in Mid-South rice cropping systems. Flood water must remain on a field for residual control throughout the season. In combination with cultural practices, benzobicyclon has shown effective on many common weeds in mid-south rice production. This herbicide does not totally control yellow nutsedge, but yellow nutsedge tuber production can be eliminated. The lack of tuber production causes the plant to have an annual growth characteristic, and by preventing tuber production this could help with the management of this weed. Benzobicyclon can be a beneficial herbicide within a herbicide program for Louisiana and mid-south rice production systems.

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