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# Evaluation of Soybean Fungicides

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### Evaluation of Soybean Fungicides

#### Abstract

Prior to the 2005 growing season, management of foliar diseases of soybean was not considered in Iowa or in much of the Midwest. However, with the introduction of Asian soybean rust caused by *Phakopsora pachyrhizi* to the United States, fungicide applications may become an additional but necessary part of midwestern soybean production. This report details the efficacy of fungicides registered for use against Asian soybean rust on fungal foliar diseases of soybean.

#### Keywords

Plant Pathology

#### Disciplines

Agricultural Science | Agriculture | Plant Pathology

## **Evaluation of Soybean Fungicides**

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#### Introduction

Prior to the 2005 growing season, management of foliar diseases of soybean was not considered in Iowa or in much of the Midwest. However, with the introduction of Asian soybean rust caused by *Phakopsora pachyrhizi* to the United States, fungicide applications may become an additional but necessary part of midwestern soybean production. This report details the efficacy of fungicides registered for use against Asian soybean rust on fungal foliar diseases of soybean.

#### Material and Methods

In 2005, Mycogen 5N327RR soybeans were planted (160,000 ppa) at Crawfordsville on April 20, 2005. Tillage was fall chisel plowing and disk/field cultivation before planting. Plots measured four rows by 30 ft with unsprayed border around each plot. Rows in plots were 30 in. apart. A randomized complete block design with four replications of each of 38 treatments was used. Treatment details are given in Table 1. All treatments were compared with an unsprayed control. The middle four rows of each plot (5 ft × 28 ft long) were mechanically harvested on September 23, 2005. Plot yields (bu/acre) and the severity (%) of brown spot and frogeye leaf spot were recorded.

#### **Results and Discussion**

Foliar diseases observed included bacterial blight, brown spot, and frogeye leaf spot. The severity of brown spot and frogeye leaf spot for each treatment were assessed (Table 1). Brown spot severity was low and ranged from 5 to 10% among the treatments. No differences between the unsprayed control and various treatments were observed. Although frogeye severity was relatively low (0–20%), fungicide differences did significantly reduce disease severity with the exception of Heads Up and Folicur (4 oz/ac) applied at growth stages R1 and R5. Phytotoxicity was observed in ten of the treatments. This was traced back to the application of tebuconazole or metconazole applied at growth stage R3. It is probable that the hot, dry conditions that occurred at the time of application predisposed the soybeans to the damage. The yield of the treatments varied from 56.273 to 72.765 bushels/acre; however, no statistical difference among the yields of all treatments could be demonstrated.

It is anticipated that the experiment will be repeated in the coming seasons, or at least until we know if Asian soybean rust will be a frequent production risk to Iowa soybean growers.

#### Acknowledgments

We would like to thanks BASF Corporation, Bayer Crop Science, Cheminova Inc., Dow AgroSciences, DuPont, SipCam Agro USA, Syngenta Crop Protection, and Valent for product support for this study.

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		Application rate		Final disease severity (%)			V: 14
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Treatments	(oz/acre)	Timing	Brown spot	Frogeye	Phytotoxicity	(bu/acre)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		(02/dere)		Blown spot	leaf spot		(bu/dele)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	DOMARK	5	R3	6.25	7.25 bcd	0 c	63.298
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	DOMARK + DOMARK	3 + 3	R1 + R5	8.75	1.75 ef	0 c	67.26
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	DOMARK + DOMARK	4 + 4	R1 + R5	6.25	5.0 bcdef	0 c	66.323
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	LAREDO / LAREDO +		R1 + 21 days				
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	HEADLINE	7/5 + 6	later	6.25	3.75 bcdef	0 c	68.13
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			R1 + 21 days				
PUNCH       4       R3       8.75       8.0 bc       0 c       60.933         PUNCH       H + 21 days       R1 + 21 days       0 c       61.755         CHARISMA       10       R3       5.50       0.0 f       0 c       72.675         CHARISMA       CHARISMA       10 + 10       later       5.50       1.0 f       0 c       67.71         CHARISMA       CHARISMA       4 + 10       later       6.25       1.75 ef       0 c       63.545         PUNCH + CHARISMA       4 + 10       later       6.25       1.75 ef       0 c       63.545         FOLICUR       4       R3       6.25       1.0 f       0 c       64.305         ECH0 + ECH0       20 + 2       V S + R3       3.50       3.5 bedef       16.25 a       64.91         IMPACT + IMPACT       7 + 7       days later       6.25       5.0 bcdef       1.25 c       59.773         IMPACT + IMPACT       7 + 7       later       6.25       5.0 bcdef       16.25 a       67.528         FOLICUR + STRATEGO       4 + 7       R1 + R3       5.50       2.25 def       0 c       69.323         STRATEGO + FOLICUR       7 + 4       Rul + 83       5.50       2.25 d	LAREDO + LAREDO	7 + 7	later	7.50	3.5 bcdef	0 c	69.838
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	PUNCH	4	R3	8.75	8.0 bc	0 c	60.933
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	CHARISMA	10	R3	5.50	5.5 bcdef	0 c	61.755
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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	ECHO + ECHO	20 + 20	V5 + R3	7.50	1.75 ef	0 c	63.483
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	ECHO + FOLICUR	20 + 4	V5 + R3	3.50	3.5 bcdef	16.25 a	64.91
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $			R1 + 28 days				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	IMPACT + IMPACT	7 + 7	later	6.25	2.25 def	0 c	69.018
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	FOLICUR + STRATEGO	4 + 7	R1 + R3	4.75	3.0 cdef	0 c	64.11
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	FOLICUR + STRATEGO	4 + 10	R1 + R3	6.25	4.25 bcdef	0 c	69.323
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	STRATEGO + FOLICUR	7 + 4	R1 R3	5.00	3.75 bcdef	16.25 a	67.528
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	STRATEGO + FOLICUR		R1 + <= 10%				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	(IF RUST)	7 + 4	rust	7.50	3.0 cdef	0 c	70.688
FOLICUR + FOLICUR $4+4$ R1 + R5       7.50       15.0 a       0 c       67.508         FOLICUR + STRATEGO $4+10$ $<<=10\%$ rust $8.75$ $6.25$ bcdef       0 c $68.903$ FOLICUR + FOLICUR $4+4$ $7-10$ days later $7.50$ $7.5$ bcd       0 c $64.343$ A12910 $4$ R3 $6.25$ $8.75$ b       0 c $63.58$ QUILT       14       R3 $4.25$ bcdef $2.5$ c $63.385$ A9901-QUADRIS EXTRA       1.03       R3 $7.50$ $4.25$ bcdef $0$ c $64.823$ TILT       4       R3 $7.50$ $4.25$ bcdef $0$ c $66.208$ CARAMBA + CARAMBA $9.6 + 9.6$ later $8.75$ $8.75$ b $7.5$ b $63.488$ CARAMBA + HEADLINE / $7.68 + 4.43/7.68$ R1 + 21 days $7.50$ $2.25$ def $1.25$ c $69.69$ CARAMBA + HEADLINE / $9.6 + 4.29/9.6 +$ R1 + 21 days $7.50$ $2.25$ def $0$ c $71.815$ HEADLINE + FOLICUR / $4.71 + 3.16/4.71$ R1 + 21 days $7.50$ $1.5$ ef $0$ c	USF2010 + USF2010	5 + 5	R1 + R3	5.50	2.25 def	11.25 b	60.073
FOLICUR + STRATEGO $4 + 10$ $< =10\%$ rust <=10% rust <=10% rust <=10% rust + $8.75$ $6.25$ bdef $0$ c $68.903$ FOLICUR + FOLICUR $4 + 4$ $7-10$ days later A $7.50$ $7.5$ bcd $0$ c $64.343$ A12910 $4$ R3 $6.25$ $8.75$ b $0$ c $63.58$ QUIL T $14$ R3 $4.25$ bcdef $2.5$ c $63.355$ A9901-QUADRIS EXTRA $1.03$ R3 $5.00$ $6.75$ bcde $0$ c $64.823$ TIL T $4$ R3 $7.50$ $4.25$ bcdef $0$ c $66.208$ CARAMBA + CARAMBA $9.6 + 9.6$ later $8.75$ $8.75$ b $7.5$ b $63.488$ CARAMBA + HEADLINE / $7.68 + 4.43/7.68$ $R1 + 21$ days $C$ $C$ ARABMA + HEADLINE / $9.6 + 4.29/9.6 +$ $R1 + 21$ days $C$ $C$ ARABMA + HEADLINE / $9.6 + 4.29/9.6 +$ $R1 + 21$ days	FOLICUR + FOLICUR	4 + 4	R1 + R5	7.50	15.0 a	0 c	67.508
FOLICUR + FOLICUR $4 + 4$ 7-10 days later       7.50       7.5 bcd       0 c       64.343         A12910       4       R3       6.25       8.75 b       0 c       63.58         QUILT       14       R3       4.25 bcdef       2.5 c       63.355         A9901-QUADRIS EXTRA       1.03       R3       5.00       6.75 bcde       0 c       64.823         TILT       4       R3       7.50       4.25 bcdef       0 c       66.208         CARAMBA + CARAMBA       9.6 + 9.6       later       8.75       8.75 b       7.5 b       63.488         CARAMBA + HEADLINE /       7.68 + 4.437.68       R1 + 21 days       6.75       3.0 cdef       0 c       71.815         CARABMA + HEADLINE /       9.6 + 9.6 + 1.21 days       14er       6.75       3.0 cdef       0 c       71.815         CARABMA + HEADLINE /       9.6 + 4.29/9.6 +       R1 + 21 days       71.815       71.815       71.815         HEADLINE + FOLICUR /       4.71 + 3.16/4.71       R1 + 21 days       71.25 c       71.733         HEADLINE + FOLICUR /       4.14.71 + 3.16       later       3.50       1.5 ef       0 c       70.733         HEADLINE / HEADLINE +       R1 + 21 days       71.25 c<	FOLICUR + STRATEGO	4 + 10	<=10% rust	8 75	6 25 bcdef	0 c	68 903
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TILT       4       R3       7.50       4.25       bedef       0 c       66.208         CARAMBA + CARAMBA       9.6 + 9.6       later       8.75       8.75       7.50       62.25       66.208         CARAMBA + HEADLINE /       7.68 + 4.43/7.68       R1 + 21 days       7.50       2.25 def       1.25 c       69.69         CARAMBA + HEADLINE /       9.6 + 4.29/9.6 +       R1 + 21 days       7.50       2.25 def       1.25 c       69.69         CARABMA + HEADLINE /       9.6 + 4.29/9.6 +       R1 + 21 days       6.75       3.0 cdef       0 c       71.815         HEADLINE + FOLICUR /       4.71 + 3.16/4.71       R1 + 21 days       6.75       3.0 cdef       0 c       70.733         HEADLINE + FOLICUR       4.14/4.71 + 3.16       later       3.50       1.5 ef       0 c       70.733         HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days       7.50       1.25 c       71.065         HEADLINE / HEADLINE +       6.14/4.71 + 3.16       later       5.00       1.25 f       1.25 c       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       5.00       1.25 f       1.25 c       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       6.25 </td <td>A9901-OUADRIS EXTRA</td> <td>1.03</td> <td>R3</td> <td>5.00</td> <td>6 75 bcde</td> <td>0 c</td> <td>64 823</td>	A9901-OUADRIS EXTRA	1.03	R3	5.00	6 75 bcde	0 c	64 823
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CARAMBA + HEADLINE       7.68 + 4.43/7.68       R1 + 21 days       0.00 + 0.	CARAMBA + CARAMBA	96 + 96	later	8 75	8 75 b	75 h	63 488
CARABMA + HEADLINE       + 4.43       later       7.50       2.25 def       1.25 c       69.69         CARABMA + HEADLINE       9.6 + 4.29/9.6 +       R1 + 21 days       7.50       2.25 def       1.25 c       69.69         CARABMA + HEADLINE       4.29       later       6.75       3.0 cdef       0 c       71.815         HEADLINE + FOLICUR       4.71 + 3.16/4.71       R1 + 21 days       1.5 ef       0 c       70.733         HEADLINE + FOLICUR       + 3.16       later       3.50       1.5 ef       0 c       70.733         HEADLINE / HEADLINE +       R1 + 21 days       1.25 c       71.065       1.25 c       70.733         FOLICUR       6.14/4.71 + 3.16       later       4.25       6.75 bcde       1.25 c       71.065         HEADLINE / HEADLINE +       R1 + 21 days       1.25 c       70.728       1.25 c       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       5.00       1.25 f       1.25 c       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       6.25       3.0 cdef       0 c       70.103         DITHANE       2.5 lbs/ac       R5       7.50       4.25 bcdef       0 c       56.273         HEADS UP       1	CARAMBA + HEADLINE /	$7.68 \pm 4.43/7.68$	R1 + 21 days	0.75	0.75 0	1.5 0	05.100
CARAMBA + HEADLINE / $9.6 + 4.29/9.6 +$ $R1 + 21$ days $1.25$ def $1.25$ def $0.05$ CARAMBA + HEADLINE / $4.29$ later $6.75$ $3.0$ cdef $0$ c $71.815$ HEADLINE + FOLICUR / $4.71 + 3.16/4.71$ $R1 + 21$ days $1.5$ ef $0$ c $70.733$ HEADLINE + FOLICUR / $4.71 + 3.16/4.71$ $R1 + 21$ days $1.5$ ef $0$ c $70.733$ HEADLINE / HEADLINE + $R1 + 21$ days         FOLICUR $6.14/4.71 + 3.16$ later $4.25$ $6.75$ bcde $1.25$ c $71.065$ HEADLINE / HEADLINE + $R1 + 21$ days         FOLICUR + FOLICUR $3.56 + 3.56$ later $5.00$ $1.25$ f $1.25$ c $70.728$ FOLICUR + FOLICUR $3.56 + 3.56$ later $6.25$ $3.0$ cdef $0$ c $70.103$ DITHANE $2.5$ lbs/ac $R5$ $7.50$ $4.25$ bcdef $0$ c $56.273$ HEADS UP       lg/L of spray       lst true leaves <td>CARABMA + HEADLINE</td> <td>+4.43</td> <td>later</td> <td>7 50</td> <td>2 25 def</td> <td>1 25 c</td> <td>69 69</td>	CARABMA + HEADLINE	+4.43	later	7 50	2 25 def	1 25 c	69 69
CARABMA + HEADLINE       4.29       later       6.75       3.0 cdef       0 c       71.815         HEADLINE + FOLICUR /       4.71 + 3.16/4.71       R1 + 21 days       1.5 ef       0 c       70.733         HEADLINE + FOLICUR       4.71 + 3.16/4.71       R1 + 21 days       1.5 ef       0 c       70.733         HEADLINE + FOLICUR       + 3.16       later       3.50       1.5 ef       0 c       70.733         HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days       70.00       1.25 c       71.065         HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days       70.00       1.25 f       1.25 c       70.728         FOLICUR       6.14/4.43 + 7.68       later       5.00       1.25 f       1.25 c       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       6.25       3.0 cdef       0 c       70.103         DITHANE       2.5 lbs/ac       R5       7.50       4.25 bcdef       0 c       56.273         HEADS UP       1g/L of spray       1st true leaves       8.75       15.0 a       0 c       64.815         UNTREATED Control       R       R       R       R       R       R       R       R       R       R <t< td=""><td>CARAMBA + HEADLINE /</td><td>9.6 + 4.29/9.6 +</td><td>R1 + 21 days</td><td>1.50</td><td>2.25 401</td><td>1.25 0</td><td>07.07</td></t<>	CARAMBA + HEADLINE /	9.6 + 4.29/9.6 +	R1 + 21 days	1.50	2.25 401	1.25 0	07.07
HEADLINE + FOLICUR /       4.71 + 3.16/4.71       R1 + 21 days       5.0 cdc1       0 c       71.015         HEADLINE + FOLICUR /       4.71 + 3.16/4.71       R1 + 21 days       1.5 ef       0 c       70.733         HEADLINE + FOLICUR /       + 3.16       later       3.50       1.5 ef       0 c       70.733         HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days       71.065       1.25 c       71.065         HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days       71.25 c       70.728         CARAMBA       6.14/4.43 + 7.68       later       5.00       1.25 f       1.25 c       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       6.25       3.0 cdef       0 c       70.103         DITHANE       2.5 lbs/ac       R5       7.50       4.25 bcdef       0 c       56.273         HEADS UP       1g/L of spray       1st true leaves       8.75       15.0 a       0 c       64.815         UNTREATED Control       -       -       -       10.00       20.0 a       0 c       65.26	CARABMA + HEADLINE	4 29	later	6 75	3.0 cdef	0 c	71.815
HEADLINE + FOLICUR       +,71 + 3.16,4.71       R1 + 21 days         HEADLINE + FOLICUR       + 3.16       later       3.50       1.5 ef       0 c       70.733         HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days       6.14/4.71 + 3.16       later       4.25       6.75 bcde       1.25 c       71.065         HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days       70.728       70.728       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       5.00       1.25 f       1.25 c       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       6.25       3.0 cdef       0 c       70.103         DITHANE       2.5 lbs/ac       R5       7.50       4.25 bcdef       0 c       56.273         HEADS UP       1g/L of spray       1st true leaves       8.75       15.0 a       0 c       64.815         UNTREATED Control       T       T       T       10.00       20.0 a       0 c       65.26	HEADLINE + FOLICUR /	4.29 4.71 + 3.16/4.71	R1 + 21 days	0.75	5.0 edel	00	/1.015
HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days       R1 + 21 days         FOLICUR $6.14/4.71 + 3.16$ later $4.25$ $6.75$ bcde $1.25$ c $71.065$ HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days $R1 + 21$ days $R1 + 21$ days $R1 + 21$ days         FOLICUR + HEADLINE +       R1 + 21 days       R1 + 21 days $R1 + 21$ days $R1 + 21$ days         FOLICUR + FOLICUR $3.56 + 3.56$ later $5.00$ $1.25$ f $1.25$ c $70.728$ FOLICUR + FOLICUR $3.56 + 3.56$ later $6.25$ $3.0$ cdef $0$ c $70.103$ DITHANE $2.5$ lbs/ac       R5 $7.50$ $4.25$ bcdef $0$ c $56.273$ HEADS UP       1g/L of spray       1st true leaves $8.75$ $15.0$ a $0$ c $65.26$ UNTREATED Control $R$ $R$ $R$ $R$ $R$ $R$ $R$ $R$ $R$	HEADLINE + FOLICUR	+3.16	later	3 50	1.5.ef	0 c	70 733
FOLICUR       6.14/4.71 + 3.16       later       4.25       6.75 bcde       1.25 c       71.065         HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days       R1 + 21 days       71.065       1.25 c       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       5.00       1.25 f       1.25 c       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       6.25       3.0 cdef       0 c       70.103         DITHANE       2.5 lbs/ac       R5       7.50       4.25 bcdef       0 c       56.273         HEADS UP       1g/L of spray       1st true leaves       8.75       15.0 a       0 c       64.815	HEADLINE / HEADLINE +	- 5.10	R1 + 21 days	5.50	1.5 01	00	10.155
HEADLINE / HEADLINE +       R1 + 21 days       R1 + 21 days       1.25 c       70.728         FOLICUR + FOLICUR       3.56 + 3.56       later       6.25       3.0 cdef       0 c       70.103         DITHANE       2.5 lbs/ac       R5       7.50       4.25 bcdef       0 c       56.273         HEADS UP       1g/L of spray       1st true leaves       8.75       15.0 a       0 c       64.815	FOLICUR	6 14/4 71 + 3 16	later	4 25	6 75 bede	1.25 c	71.065
Introduct /	HEADLINE / HEADLINE +	0.14/4./1 + 5.10	R1 + 21 days	7.20	0.75 bede	1.25 0	/1.005
CHICKINDA     O.14/14.91 + 760     Rate     5.00     R.25 T     1.25 T     1.25 C     70.726       R1 + 21 days     R1 + 21 days     R1 + 21 days     R1	CARAMBA	6 14/4 43 + 7 68	later	5.00	1 25 f	1.25 c	70 728
FOLICUR + FOLICUR       3.56 + 3.56       later       6.25       3.0 cdef       0 c       70.103         DITHANE       2.5 lbs/ac       R5       7.50       4.25 bcdef       0 c       56.273         HEADS UP       1g/L of spray       1st true leaves       8.75       15.0 a       0 c       64.815		0.1 + CT.T.	R1 + 21 dave	5.00	1.401	1.20 0	10.120
DITHANE     2.5 lbs/ac     R5     7.50     4.25 bcdef     0 c     56.273       HEADS UP     1g/L of spray     1st true leaves     8.75     15.0 a     0 c     64.815	FOLICUR + FOLICUR	3 56 + 3 56	later	6.25	3.0 cdef	0.0	70 103
HEADS UP1g/L of spray1st true leaves8.7515.0 a0 c64.815UNTREATED Control10.0020.0 a0 c65.26	DITHANE	2.50 + 3.50	R5	7 50	4 25 bodef		56 273
$\frac{11}{1000} \text{ or } 1000 \text{ or } 10000 \text{ or } 100000\text{ or } 1000000\text{ or } 1000000000\text{ or } 100000000000000000\text{ or } 100000000000000000000000000000000000$	HEADS LIP	2.5 105/ac 1g/L of spray	Ist true leaves	8 75	15.0 a		64 815
	LINTREATED Control		-	10.00	20.0 a		65.26

Table 1. Evaluation of fungicides registered for use against Asian soybean rust, brown spot, and frogeye leaf spot during 2005 at Crawfordsville.

<sup>1</sup>Means sharing a common letter do not differ significantly according to the Waller-Duncan t test (P<0.05).