The Consistency Of Winter Canola East of the Rocky Mountains

C.L. Rife
Department of Agronomy, Kansas State University, 2004 Throckmorton Plant Science Center
Manhattan, KS 66506-5501, 785-532-6825; Fax: 785-532-6094; crife@oznet.ksu.edu

Introduction

Winter canola yields are generally 30% greater than yields of spring canola. Winter canola is planted in late summer about six weeks prior to the first killing freeze date. The plants need to reach the 6 to 8 true-leaf stage and about 8 to 10 inches in height to increase winter hardiness before freeze down. Plants overwinter as rosettes and bolt early the next spring. Harvest takes place about the same time as winter wheat harvest in a given area.

Canola research began in the United States in the late 1980's. Industrial rapeseed had been investigated prior to this, but because of the limited demand for this product, interest was low. Winter canola production was attempted in many parts of the United States in the late 1980's but success was limited. The failure was primarily due to the lack of adapted varieties, the lack of management recommendations for the areas, and the lack of local markets for the crop. Since that time, canola-quality lines have been developed that are significantly improved over previously tested varieties. Increased oil consumption has led to increased demand for canola seed and interest by oil processors.

Winter canola production would fit well into cropping systems in many regions of the country. Canola makes an excellent rotational crop with winter wheat. Yields of wheat following canola are reported to be 8 to 12% better than yields of wheat following wheat. Because canola is a broadleaf crop, more effective and less expensive herbicides can be used to control grass weeds. No major diseases are common between the two crops, so canola can help break some disease cycles. Canola also is produced with the same equipment used for small grains. A major investment in equipment is not needed to try a small acreage of canola. Because canola is an oilseed, its commodity price is not tied to that of grains, and it can be used to help spread economic risk to more than one commodity class.

The odds of success at a given location are primarily determined by three factors: the genetics of the cultivars grown, the environment at that particular location, and management of the crop. Over the past 10 years, material has been developed in both North America and Europe that represents a 25% increase in winter hardiness over the germplasm that was available in the late 1980 s.' Production research has led to management recommendations consistent with the conditions of the various regions. A data set was compiled that describes the areas of the country where new cultivars coupled with best available management recommendations will consistently produce a good crop of winter canola. The objectives of this paper were to describe the fate of National Winter Canola Variety Trial (NWCVT) sites and determine the regions of the country where winter canola production would be most consistent.

Procedures

Since 1994, the NWCVT has been distributed to 37 locations in 17 states, representing 215 site/years of data. Management guidelines were supplied to each cooperator, but past experience at that locality was used for final management decisions. All tests were planted in small plots (approximately 100 square feet) and replicated three

times. Data were collected for fall stand, winter survival, yield, and other important agronomic traits. Test sites were included in USDA Plant Hardiness Zones 4 through 8. Average annual precipitation ranged from 11 to 57 inches. The results presented here were compiled from data obtained in the NWCVT. Mean yield and survival data are averages of the performance of 'Ceres,' 'Jetton,' 'Plainsman,' and 'Wichita.'

Results

During the past eight years of testing, 137 of 215 environments (64%) were harvested. Of the sites that were not harvested, the greatest cause for abandonment was failure to establish the plots in a timely manner. This included conditions too dry to get the crop established, soil crusting or flooding caused by heavy rains, insect damage, or establishment too late in the fall for a fair test. Loss of the test after all danger of winterkill was the second reason for test abandonment. The greatest reason for late test failure was adverse weather near harvest that caused high levels of shattering. Other causes included herbicide drift or improper pesticide use, insect damage, and tests purposely destroyed for other uses. Winterkill included tests that were lost over the winter or early spring because of cold temperatures and/or dry soil conditions. Each of these three major categories accounted for about one third of the abandoned locations.

Individual test locations represent a wide range of environments with varied levels of crop success (Table 1). The region of the country with the lowest percent of harvested tests was the High Plains (Table 2). The best success rate was observed in the Southeast region. The High Plains locations are predominately found in USDA Plant Hardiness Zones 4 and 5 and all locations receive less than 20 inches of annual precipitation; both factors contributed to test abandonment (Tables 3 and 4). Winter canola has been much more consistent in the High Plains, in both research plots and commercial production, when grown under irrigation. Nearly all of the Central Plains and Midwest locations are found in Plant Hardiness Zones 5 and 6. However, the Midwest locations averaged about 10 inches more annual precipitation and this probably accounts for the greater level of harvested sites and the reduced level of winterkilled sites found in that region.

Summary

Many factors contribute to the abandonment of research plots that would not be a concern to a solid stand of commercial production. During marginal fall environments, variability in seed lot vigor has contributed to abandoned tests. Severe weather events have occurred between the time that the earliest and latest maturing entries were ready to harvest, also causing test abandonment. Even though the majority of the entries were lost at those sites that were abandoned because of winterkill, 45% of abandoned locations had at least one entry with winter survival greater than 50%. It is estimated that a field planted with good quality, vigorous seed of an adapted variety would have been harvested at nearly 80% of the 215 test environments.

Recently released winter canola cultivars have the potential of consistently producing a crop in the southern part of Zone 5, and Zones 6, 7, and 8. Current recommendations are to only plant winter canola on irrigated fields in areas that receive less than 20 inches of annual precipitation. This will not only benefit establishment but also reduce the potential for desiccation over the winter months.

Table 1. Environmental Factors and Performance of Winter Canola at 37 Test Locations in the United States.

	Region	Hardiness Zone	Annual Precip. inches	Avg. Yield lb/a	Site Years #	Harvested %	Winterkill %
Ft Collins, CO	High Plains	5	15	2149	7	14	0
Rocky Ford, CO	High Plains	5	11	752	3	33	0
Walsh, CO	High Plains	5	17	1261	6	33	0
Colby, KS	High Plains	5	18	1037	8	63	13
Garden City, KS	High Plains	5	18	1110	8	38	38
Sidney, NE	High Plains	4	16	444	8	25	25
Goodwell, OK	High Plains	6	17	1115	1	100	0
Bushland, TX	High Plains	6	16	1633	4	50	25
Lubbock, TX	High Plains	7	19	510	8	50	0
Archer, WY	High Plains	4	13	476	2	50	50
Torrington, WY	High Plains	4	14	1848	3	67	33
Mean				1059		39	15
Bellville, KS	Central Plains	5	20	-----	2	0	100
Hutchinson, KS	Central Plains	6	28	1850	8	75	0
Kingman, KS	Central Plains	6	22	2175	1	100	0
Manhattan, KS	Central Plains	5	32	1345	8	63	13
Lincoln, NE	Central Plains	5	28	1270	8	38	50
Munday, TX	Central Plains	7	26	1297	7	100	0
Mean				1495		63	20
Bellville, IL	Midwest	6	39	2066	8	75	0
Carbondale, IL	Midwest	6	43	2014	8	63	13
Columbia City, IN	Midwest	5	36	2116	5	100	0
Ottawa, KS	Midwest	5	33	1060	5	40	0
Parsons, KS	Midwest	6	40	1189	8	50	13
East Lansing, MI	Midwest	5	29	1963	4	100	0
Columbia, MO	Midwest	5	38	1398	8	88	13
Novelty, MO	Midwest	5	36	1980	6	67	33
Mean				1770		71	10
Meridanville, AL	Southeast	7	57	2181	6	67	0
Fayettville, AR	Southeast	6	45	1576	6	50	17
Kibler, AR	Southeast	7	41	2100	7	71	0
Mariana, AR	Southeast	7	54	3107	2	50	0
Calhoun, GA	Southeast	7	56	1697	6	100	0
Griffin, GA	Southeast	7	52	1986	6	100	0
Portageville, MO	Southeast	6	36	1349	5	80	0
Holly Springs, MS	Southeast	7	55	1399	5	80	20
Prairie, MS	Southeast	7	54	1097	5	60	20
Orange, VA	Southeast	6	43	1944	6	100	0
Petersburg, VA	Southeast	7	44	2155	6	100	0
Suffolk, VA	Southeast	7	47	1413	6	100	0
Mean				1787		82	5

Table 2. Fate of 215 Winter Canola Evaluation Sites Averaged over four Geographical Regions.

	Tests Sites #	Harvested	Not Established	Winterkill	Lost Post Winter
		--------------------------------%			------------------------------
High Plains	62	39	21	15	26
Central Plains	35	63	9	20	9
Midwest	52	71	8	10	12
Southeast	66	82	11	5	3

Table 3. Fate of 215 Winter Canola Evaluation Sites Averaged over four USDA Winter Hardiness Zones.

	Tests Sites #	Harvested	Not Established	Winterkill	Lost Post Winter	Mean Survival	Locs With 100% Surv.
		--%					--
Zone 4	13	38	8	31	23	48	8
Zone 5	82	51	20	17	12	67	20
Zone 6	56	68	7	7	18	80	30
Zone 7	64	81	10	3	6	91	48
Overall	215	64	13	11	12	75	30

Table 4. Fate of 215 Winter Canola Evaluation Sites Averaged over three Mean Precipitation Regimes.

	Tests Sites #	Harvested	Not Estab.	Winterkill	Lost Post Winter	Mean Survival	Locs With 100% Surv.
		--%					---
11 to 20 in/yr	64	38	20	17	25	62	13
20 to 40 in/yr	82	71	7	11	11	75	29
40 to 57 in/yr	69	80	11	6	3	90	49