GOVERNMENT

PEACE REGION WINTER CEREALS AND GRASSES RELAY INTO ANNUAL CEREALS

Soil quality is reduced in land agriculturally managed to grow crops of a single species for yield optimization. This also implicates heavy applications of herbicides and pesticides for field maintenance. Since the soil is the pillar from which our food grows, sustainable agriculture is crucial to maintain the quality of our soil and subsequently, our crops. This can be established through small steps. If there is a crop that produces acceptable yields under conditions where fertilization and pesticide application have been the same for the last few years, another crop, of similar species or physiology could be tried in the same ground. This is a problem because no matter how similar they are: different crops, different seeds. Seed separation thus, becomes a conundrum. To circumvent this, a relay seeding method could be adopted. In this way, a cash crop can be sown early in the growing season and within a month or so, a second crop is then seeded. This is conducted by taking advantage of the fact that the first crop planted has not grown tall enough to be ruined by machinery while placing the second crop into the ground. Best management practices (BMPs) are present because (a) ground coverage is present, which may reduce potential soil erosion form air and water after the end of the growing season, (b) a living root is kept which preserves the dynamism of the soil underground system, even during the cold months of the year and (c) this becomes a door to try and innovate strategies of relay intercropping.

Harvesting will consequently occur at the end of the growing season and possibly in the middle of the growing season the following year. In turn, every second year there is a chance that two harvests would be performed during the growing season. More importantly harvest of the relay crop could also be conducted without damaging the crop seeded early spring the year prior. Similar to the way seeding was carried out for this same crop. It is hypothesized that through this system, lower seeding rates on the winter cereals will lead to higher yields from annual cereals due to less competition for water. Moreover, fall rye, and triticale will have the highest winter survivability values, thus may not benefit from higher seeding rates when interseeded with spring wheat the prior growing season. Hence our objectives are: (a) to determine the optimal seeding rate of winter cereals interseeded with annual cereals. Two winter cereal seeding rates will be examined. and (b) To observe how relay cropping influences yield, test weight, and protein content in spring wheat and likely winter cereals, as well as other factors such as weed management.

Number of spring wheat stands sown at full recommended seeding rate in control plots and half the recommended seeding rate in relay plots and winter crop stands sown at 25 and 12.5 % of their recommended seeding rate

Treatment	Spring wheat		Winter crop	
	plants foot-2			
Control	2.56	A		
Annual ryegrass	1.70	BC	1.48	A
Annual ryegrass	1.59	C	1.40	ABC
Rye	1.69	BC	1.11	CD
Rye	1.56	C	1.05	D
Winter triticale	1.88	B	1.15	BCD
Winter triticale	1.55	C	1.47	A
Winter wheat	1.86	B	1.42	AB
Winter wheat	1.66	BC	1.49	AB
Standard error	0.7		1.0	

The greatest number of stand counts was found in control plots compared to the other treatments ($P<0.0001$). There is no competition from other cereal or grass species in control plots which makes wheat stands grow more prominently. Wheat stands were also more numerous in plots that were also sown to 25% of the recommended seeding rate of either winter triticale and winter wheat in June compared to rye and ryegrass at the same seeding rate percentage and also to winter triticale seeded at 12.5% of the recommended rate. Since triticale and winter wheat are closer plant species than rye and ryegrass this may have contributed to greater wheat growth. In addition, ryegrass and rye have strong allelopathic properties that may have hindered wheat growth as these plants were developing.

Ryegrass and triticale individuals sown at 12.5 and 25% of their recommended seeding rate respectively were more numerous than rye individuals at either rate ($P=0.0364$). Given the conditions endured by these crops this growing season, which were mostly dry with two precipitation events in May and August, it can be argued that ryegrass and triticale are more resilient crops than rye and winter wheat. Thus if the goal is to have as much spring crop individuals as possible, with enough number of winter crop stands for the next season, the best relay crop for this then would be triticale at 25% of the recommended rate.

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Spring wheat yield sown at full recommended seeding rate in control plots and half the recommended seeding rate in relay plots and winter crop stands sown at 25 and 12.5 % of their recommended seeding rate

	Percentage seeding rate	Yield	
	%	bu acre-1	
	0	36.21	A
	12.5	31.79	B
	25	31.67	B
Winter crop relay			
No crop (control)	_	36.21	A
Annual ryegrass	_	30.50	C
Rye	_	33.48	AB
Winter triticale	_	31.42	BC
Winter wheat	_	31.51	BC
Control	0	37.55	
Annual ryegrasss	12.5	30.54	
	25	30.55	
Rye	12.5	32.78	
	25	34.17	
Winter triticale	12.5	32.27	
	25	30.46	
Winter wheat	12.5	31.65	
	25	31.37	
Standard error		17.4	

Spring wheat yield was affected by winter crop used as a relay. As such, wheat with a rye yielded as much as the control and more than wheat yield with an annual ryegrass relay. Seeding rate of the winter crop does decrease winter yield to an extent ($P=0.0153$). But between winter crop seeding rates, these have the same effect in wheat yield, hence wheat yield will likely be greater than that of plots sown to annual ryegrass relay regardless of seeding rate percentage. Test weight ($P=0.1682$ and 0.2184 for seeding rate and relay effect respectively) and protein content ($P=0.7213$ and 0.5233 for seeding rate and relay effect respectively) were the same across treatments. Interactions between seeding rate and relay winter crop were not influential in test weight ($P=0.0849$) or protein content ($P=08515$). Ween cover was unaffected by treatments ($P=0.7259$). Results did show however that weed cover fluctuated ($P<0.0001$). Weed cover was lower in June and August whereas there was an increase in July, due to opportunistic weeds that were able to proliferate in the dire dry conductions occurring during that month.

KEY POINTS:

- **The best relay crop for ensuring enough spring wheat stands is triticale at 25% of the recommended rate.**
- **Rye relay is likely the best crop to ensure greater wheat yield in the first growing season**
  - **Annual ryegrass on the other hand may reduce wheat yield**
- **Winter relay crops have no influence in test weight or protein content.**