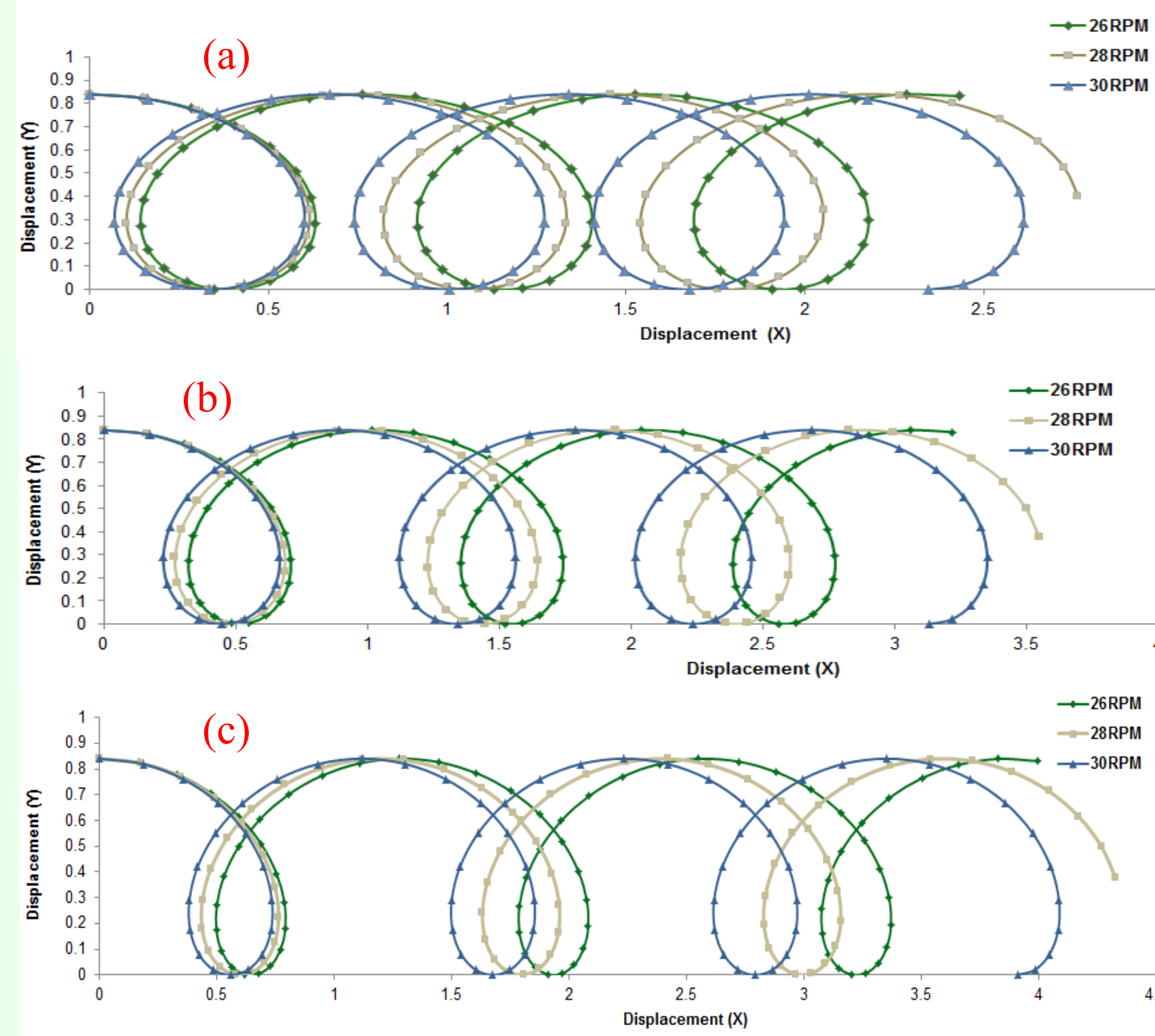


Precision Agriculture Research Program

Introduction

Over the past two decades, the wild blueberry yield has increased significantly. Therefore, it is very important to modify existing wild blueberry harvesting machines, so that they are able to pick maximum possible berries during harvesting operation. Before modifications, the quantification of current capacity of harvester head is evident. The picker bars of the existing wild blueberry harvester are capable of picking and transferring certain amount of berries to the conveyor. However, the maximum capacity of the picker bars is still unknown.

Therefore, the objective of this study was to quantify and compare the carrying capacities of 16 and 12 bars heads.



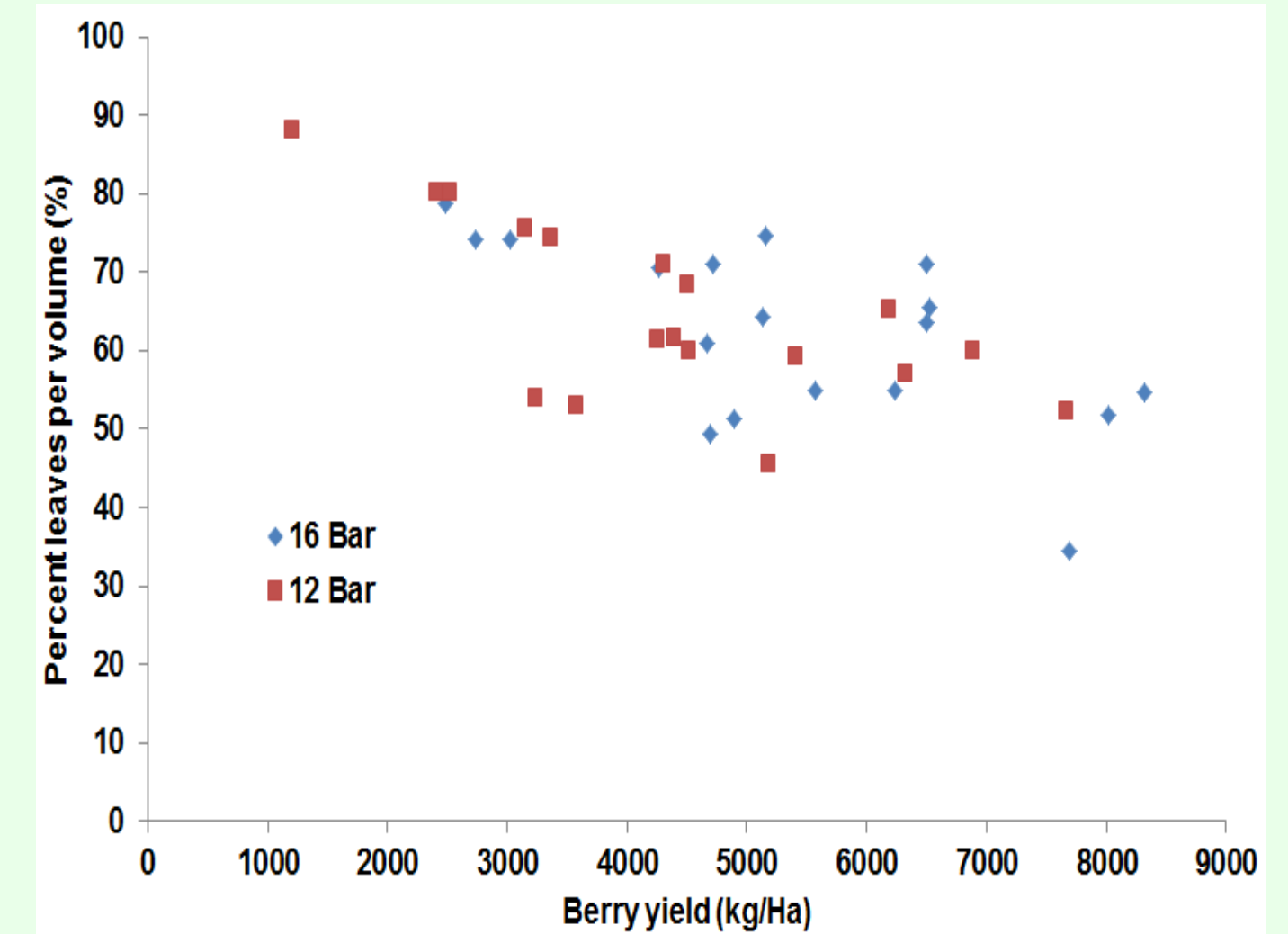
Position of Point on Harvester Head at (a) 1.2, (b) 1.6 and (c) 2 km h⁻¹

Results

- ✓ The average coefficient of friction between the berries and the picker teeth was experimentally found to be 0.289.
- ✓ Correlation between the total berry yield and the percent leaves per volume harvested was found.
- ✓ The lowest harvested berry yield was recorded for 12 bar header, whereas the highest harvested berry yield was noted for 16 bar harvester head.
- ✓ It was also found that the percent leaves by volume was independent of the number of bars on the harvester head.

Methodology

It has been experimentally determined that the best combination to minimize losses is 1.2 km h⁻¹ and 26 RPM. Emphasis has been put on this combination for analysis. In order to address capacity problems in a theoretical, mathematical approach, laws of physics were applied. A small experiment in lab was completed to find the coefficient of static friction between blueberries and teeth on the picker bars. The necessary laboratory calculations (centripetal force, the impact force due to horizontal motion, the impact force due to rotational motion of header, the force due to acceleration of teeth tips and maximum capacity of the heads) were completed before field experiments.



Comparison of Percent Leaves per Volume and Total Yield of Berries in kg ha⁻¹



Cut Away Model of Harvester Head

Maximum Capacity Summary of 16 bar Harvester Head for 26 RPM at 1.2 km h⁻¹

Capacity (kg ha ⁻¹) when head containing leaves by volume (%):	Plant Coverage (%)	30	40	50	60	65	70	75	80	85	90	95	100
	0	7670	10227	12784	15341	16619	17898	19176	20455	21733	23011	24290	25568
5	7286	9716	12145	14574	15788	17003	18217	19432	20646	21861	23075	24290	
10	6903	9205	11506	13807	14957	16108	17259	18409	19560	20710	21861	23011	
15	6519	8694	10867	13040	14126	15213	16300	17386	18473	19560	20646	21733	
20	6136	8183	10228	12273	13295	14318	15342	16363	17387	18409	19432	20454	
25	5752	7672	9589	11506	12464	13423	14383	15340	16300	17259	18217	19176	
30	5369	7161	8950	10739	11633	12528	13425	14317	15214	16108	17003	17897	
40	4602	6136	7670	9205	9971	10739	11506	12273	13040	13807	14574	15341	
50	3835	5114	6392	7670	8310	8949	9588	10227	10866	11506	12145	12784	
60	3068	4091	5114	6136	6648	7159	7670	8182	8693	9204	9716	10227	
65	2685	3580	4474	5369	5817	6264	6712	7159	7607	8054	8501	8949	
70	2301	3068	3835	4602	4986	5369	5753	6136	6520	6903	7287	7670	
80	1534	2045	2557	3068	3324	3580	3835	4091	4347	4602	4857	5114	

Maximum Capacity Summary of 12 bar Harvester Head for 26 RPM at 1.2 km h⁻¹

Capacity (kg ha ⁻¹) when head containing leaves by volume (%):	Plant Coverage (%)	30	40	50	60	65	70	75	80	85	90	95	100
	0	5753	7670	9588	11506	12464	13423	14382	15341	16300	17259	18217	19176
5	5465	7287	9109	10930	11841	12752	13663	14574	15485	16396	17306	18217	
10	5178	6903	8629	10355	11218	12081	12944	13807	14670	15533	16396	17259	
15	4890	6520	8150	9780	10595	11410	12225	13040	13855	14670	15485	16300	
20	4602	6136	7670	9204	9972	10739	11506	12273	13040	13807	14574	15341	
25	4315	5753	7191	8629	9348	10067	10786	11506	12225	12944	13663	14382	
30	4027	5369	6712	8054	8725	9396	10067	10739	11410	12081	12752	13423	
40	3452	4602	5753	6903	7479	8054	8629	9204	9780	10355	10930	11506	
50	2876	3835	4794	5753	6232	6712	7191	7670	8150	8629	9109	9588	
60	2301	3068	3835	4602	4986	5369	5753	6136	6520	6903	7287	7670	
65	2013	2685	3356	4027	4363	4698	5034	5369	5705	6040	6376	6712	
70	1726	2301	2876	3452	3739	4027	4315	4602	4890	5178	5465	5753	
80	1151	1534	1917	2301	2493	2685	2876	3068	3260	3452	3643	3835	