Josephinum Research
Wieselburg

Investigations into baler-wrapper combinations

Mass flow rate, bale density, power requirements, and silage quality

Wieselburg, Austria, 2024

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Contents

1 Question

After silage clamps, wrapped round bale silage is the most popular way of preparing wilted silage in Central Europe. Performance figures and the associated feed quality are key parameters for the ongoing development of baler-wrapper combinations that produce wrapped round bale silage. These parameters are also important for farms' decision-making about investments. The aim of the project is to answer the following research questions:

- What impact does the number of cutting knives in the round baler's cutting device (silage cutting length) have on bale density and the baler-wrapper combinations' power requirements at the tractor PTO shaft?
- What impact do the driving speed and the mass flow rate in the round baler have on bale density, the power requirements at the tractor PTO shaft, and the impact force of the baler-wrapper combinations?
- How does the quality of the silage change if a wide film is used for the round bales instead of net binding?
- How does the G-1 F125 Kombi baler-wrapper combination differ from the VARIO-Master V140 in terms of power requirements, mass flow rate, bale density, and feed quality?

2 Methodology

2.1 Investigated variants

The following six variants were investigated:

- V1: Half cutting knife set, net binding, 7 km/h
- V2: Full cutting knife set, net binding, 7 km/h
- V3: Full cutting knife set, wide film, 7 km/h
- V4: Full cutting knife set, wide film, 10 km/h
- V5: Chopped material, wide film
- V6: Chopped material, net binding

Variants V1 to V4 were carried out using the G-1 F125 Kombi baler-wrapper combination. For variant V1, the cutting unit was fitted with the half cutting knife set and for variants V2 to V4, the cutting unit was fitted with the full cutting knife set (30 knives, 35 mm spacing between knives). For variants V1 and V2, the bales were bound with net and for variants V3 and V4, the bales were bound with wide film. The target driving speed during baling was 7 km/h for variants V1 to V3 and 10 km/h for variant V4. For variants V5 and V6, the VARIO-Master V140 was used for the baling of chopped material, which was chopped to a length of 4 mm with a Krone BiG X 480.

All variants were carried out on the same area of land. Six bales were baled for each variant. This was carried out in the following order:

- Bales 1 to 3 of variant V2: Full cutting knife set, net binding, 7 km/h
- Bales 1 to 3 of variant V3: Full cutting knife set, wide film, 7 km/h
- Bales 1 to 3 of variant V4: Full cutting knife set, wide film, 10 km/h
- Bales 1 to 3 of variant V1: Half cutting knife set, net binding, 7 km/h
- Bales 4 to 6 of variant V1: Half cutting knife set, net binding, 7 km/h
- Bales 4 to 6 of variant V4: Full cutting knife set, wide film, 10 km/h
- Bales 4 to 6 of variant V3: Full cutting knife set, wide film, 7 km/h
- Bales 4 to 6 of variant V2: Full cutting knife set, net binding, 7 km/h
- Bales 1 to 3 of variant V5: Chopped material, wide film
- Bales 1 to 3 of variant V6: Chopped material, net binding
- Bales 4 to 6 of variant V6: Chopped material, net binding
- Bales 4 to 6 of variant V5: Chopped material, wide film

2.2 Measurement of power at the PTO shaft

The power at the PTO shaft was measured using a torque transducer with an integrated tachometer that was mounted on the tractor PTO shaft stub. The driving speed and the distance covered were captured using a GNSS sensor. The data supplied by these sensors was recorded using an IMC PL data recording system with a 1,000 Hz sampling rate.

2.3 Workflow

During the power measurement, the work sequence was documented over the progress period from the start of measurement.

The following times were recorded:

- The start of the baling process (start of feed intake via pick-up)
- The end of the baling process (end of feed intake via pick-up)
- Start of tailgate opening for bale transfer
- End of tailgate closing for bale transfer
- Start of the wrapping process
- End of the wrapping process
- End of bale deposit process
- Start and end of a turning process
- Start and end of a malfunction

2.4 Bale dimensions

The finished bales were weighed and their circumference and width were measured at three points. These measurements were then used to calculate the bale volume and density. The dry matter content from the findings in relation to the silage quality was used to calculate the bale density in terms of the dry matter.

2.5 Average swath density and average mass flow rate

The average swath density was calculated on the basis of the bale weight and the recorded swath length. The swath length was determined from the distance covered from the start to the end of the baling process, not including distances that were covered while turning bales or during malfunctions.

The average mass flow rate in the baler was calculated using the bale weight and the baling time. The baling time covers the period from the start to the end of the baling process and does not include any periods for turning or malfunctions.

2.6 Test conditions

The test was conducted on a temporary pasture planted with ryegrass during the third cut on July 9, 2024. Swaths with a swath width of 130 cm were created with a four-rotor swather (Claas Liner 4700 Business). The average swath weight was 2.1 kg/DM/m. There were no significant differences between the variants based on a one factor analysis of variance.

Figure 1: Four-rotor swather (Claas Liner 4700 Business)

Figure 2: G-1 F125 Kombi pulled for testing by a Valtra T174 (129 kW)

Figure 3: Krone BiG X 480 with an adjusted chop length of 4 mm

Figure 4: VARIO-Master V140 powered for testing by a Valtra T174 (129 kW)

2.7 Cutting length

The distribution of the particle lengths in the silage was determined using an image analysis method. For this, four samples per bale of 60 g to 100 g of dry matter were spread out on a conveyor belt and digitalized using a calibrated near-infrared camera. The images captured were evaluated automatically by measuring the maximum length of each particle. The lengths measured were then classified in increments of 1 mm and the frequency of each class was determined as a proportion of the combined total length.

The samples were collected when the bale was opened for feeding.

2.8 Silage quality

The silage quality was measured in the feed laboratory of the Lower Austrian Chamber of Agriculture (LK NÖ) in Wieselburg. The parameters investigated are summarized in Figure 5.

Sample collection was carried out using two radial cores per bale. The drilling depth was 65 cm and the core diameter was 70 mm.

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Probennummer	2024 11 1112
Kategorie	Wiederkäuerfutter
Probeneingang	20-11-2024
Verpackung	ordnungsgemäß
Versiegelung	nein
Befundung	02-12-2024
Projekt	

Probenbezeichnung: Grassilage 3.Schnitt V32

A N A L Y S E N E R G E B N I S S E

Nährstoffe (g/kg)		TM	Bew	UM
Trockenmasse (je kg Futter)	TM	489	↑ 1	a
Rohprotein	XP	146	↓ 2	a/b
Nutzbares Rohprotein	nXP	121		c
Unabgebautes XP 15 %	UDP	22		c
N-Bilanz im Pansen	RNB	4		c
Gerüstsubstanzen	NDF			a/b
Lignozellulose	ADF			a/b
Lignin	ADL			a
Rohfaser	XF	334	↑ 3	a/b
Nicht-Faser-Kohlenhydrate	NFC			c
Stärke	XS			a/b
Zucker	XZ	44	✓	a/b
Rohfett	XL	27		a/b
Rohasche	XA	95	✓	a

Energiebewertung (MJ/kg)		TM	Bew	UM
Verdaul. der org. Masse %	dOM	65,0		c
Umsetzbare Energie	ME	9,0	↓ 4	c
Nettoenergie Laktation	NEL	5,2		c

Mengenelemente (g/kg)		TM	Bew	UM
Kalzium	Ca			a
Phosphor	P			a
Magnesium	Mg			a
Kalium	K			a
Natrium	Na			a

Spurenelemente (mg/kg)		TM	Bew	UM
Eisen	Fe			a
Mangan	Mn			a
Zink	Zn			a
Kupfer	Cu			a

Gärqualität (g/kg)		%	TM	Bew	UM
Milchsäure	MS	79	48,3	✓	a
Essigsäure	ES	16	9,6	↓ 5	a
n-Buttersäure	BS	4	2,5	✓	a
Propionsäure	PS	1	0,6		
Gesamtsäure	GS	100	61,0		c
Ethanol	EtOH		2,5	✓	a
1,2 Propandiol			0,2		a
Ammoniak-N (% des N)	NH_3-N	9,3		↑ 6	c
pH-Wert		4,7 (soll < 5,0)			a
Punkte Gärqualität (nach DLG 1997)		100			c
Note Gärqualität		1 sehr gut			c
Dichte	kg TM/m³		(soll >)		c

weitere Parameter			TM	UM
Stickstoff	N	(g/kg)	23,4	a/b
Ammoniak+Ammonium	NH_3+NH_4^+	(g/kg)	2,6	a
Schwefel	S	(g/kg)		a
Chlor	Cl	(g/kg)		a
Selen	Se	(mg/kg)		a
Salzsäureunlösliche Rohasche		(g/kg)		a
Enzyml. org. Substanz	ELOS	(g/kg)		a
Kationen-Anionenbilanz	DCAB			c

mikrobiologische Analyse	KBE/g Futter	Bew	UM
präsumtive sulfitreduzierende Clostridien			a

Informationen hierzu unter www.futtermittellabor.at

Information

TM: Gehalt je kg Trockenmasse (/10 = Gehalt in %)
Bew: Bewertung – zusätzliche Information auf der Rückseite
UM: Untersuchungsmethode:
a = nasschemisch nach dem VDLUFA-Methodenbuch
b = Nah-Infrarot-Reflexionsspektroskopie (NIRS)
c = Parameter wurde berechnet
KBE/g: kolonienbildende Einheiten je g Frischfutter
Energiebewertung auf Basis der DLG-Futterwerttabellen

Rohnährstoff- und Zuckeranalyse mittels Infrarotmessung (NIRS).

Auskünfte:

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Analytik	Ing. Thomas Kraushofer	05/0259 – 42204

Für die Richtigkeit der Angaben

DI Gerald Stögmüller
Laborleiter

Figure 5: Example of an examination finding of the LK NÖ feed laboratory

2.9 Data evaluation

The statistical evaluation of the data was carried out using Statgraphics 19. Where the data showed variance homogeneity and a normal distribution, an analysis of variance with subsequent Tukey HSD test was performed to compare the average values of the individual variants. Where there was no variance homogeneity and a normal distribution in the data, a Kruskal-Wallis test was carried out. A 5% significance level was used across the board.

3 Results

3.1 Mass flow rates actually achieved in the measurements

With the G-1 F125 Kombi, the mass flow rate in the baler depended on the swath weight and the driving speed during baling. With the VARIO-Master V140, the filling level and the speed of the feeding device were decisive factors.

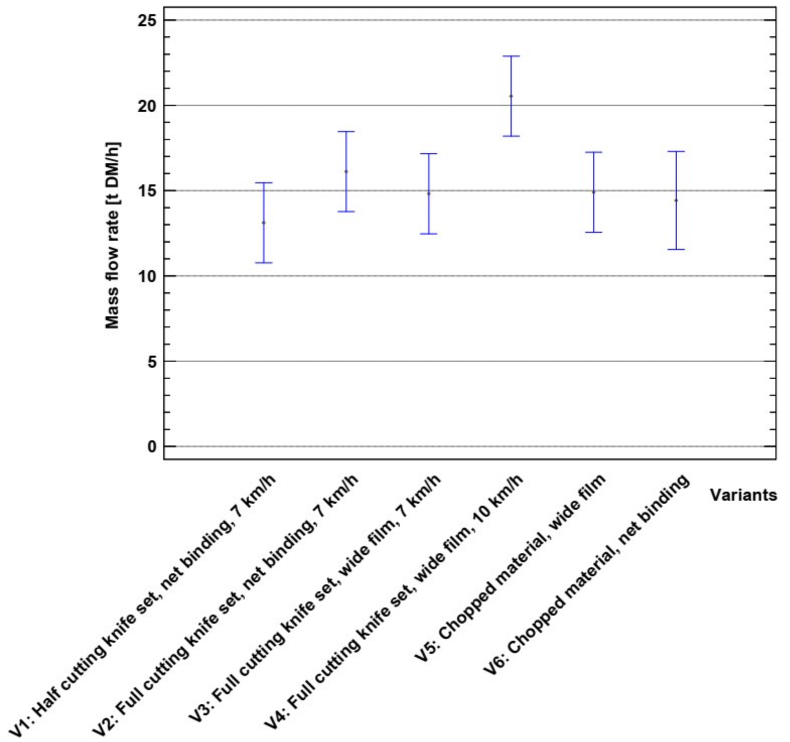

Figure 6: Mass flow rate in the baler for the individual variants

In Figure 6, the mass flow rates for variants V1 to V3 should be identical. Differences did occur due to the fluctuations in the swath weights and the actual driving speeds, but these were not significant in a simple analysis of variance. The mass flow rate in variant V4 was significantly higher as the target driving speed was higher at 10 km/h. The mass flow rates in variants V5 and V6 did not differ significantly from one another or from variants V1 to V3.

3.2 Bale diameter and bale volume

The bale width for both balers was 125 cm. The average bale diameters of the individual variants were between 136 and 138 cm (see Figure 7) and the average bale volume varied between 1.81 and 1.86 m³. The differences were not statistically significant on the basis of an analysis of variance.

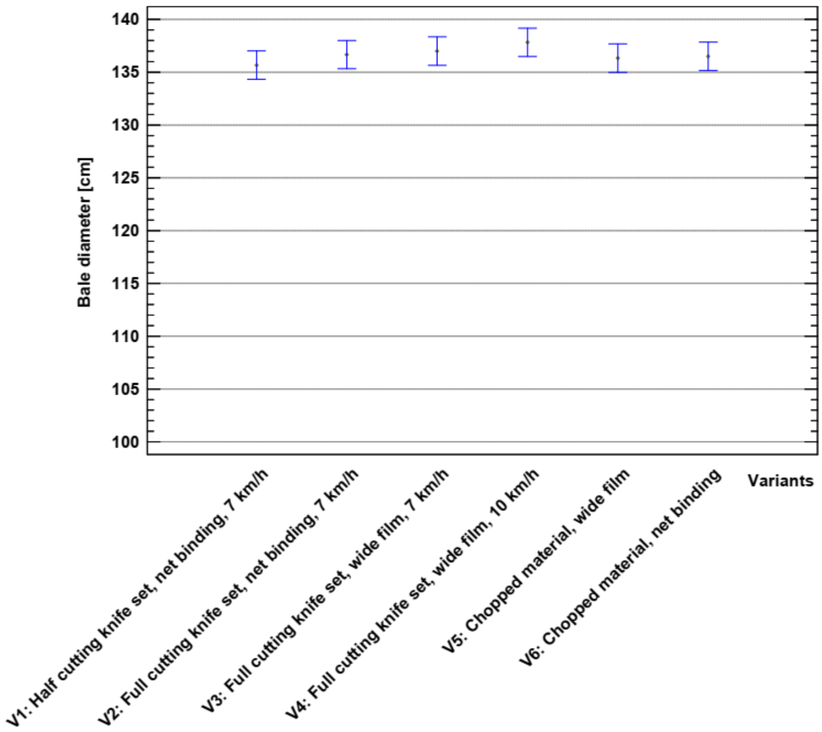

Figure 7: Bale diameters for the individual variants

3.3 Bale mass

With regard to the average bale masses, the bales from the G-1 F125 Kombi differ significantly from those from the VARIO-Master V140 in terms of both the fresh matter (Figure 8) and the dry matter (Figure 9). Reasons for this could be the type of baler and the forage cutting length (see section 3.6). There were no significant differences between the bales from the same baler.

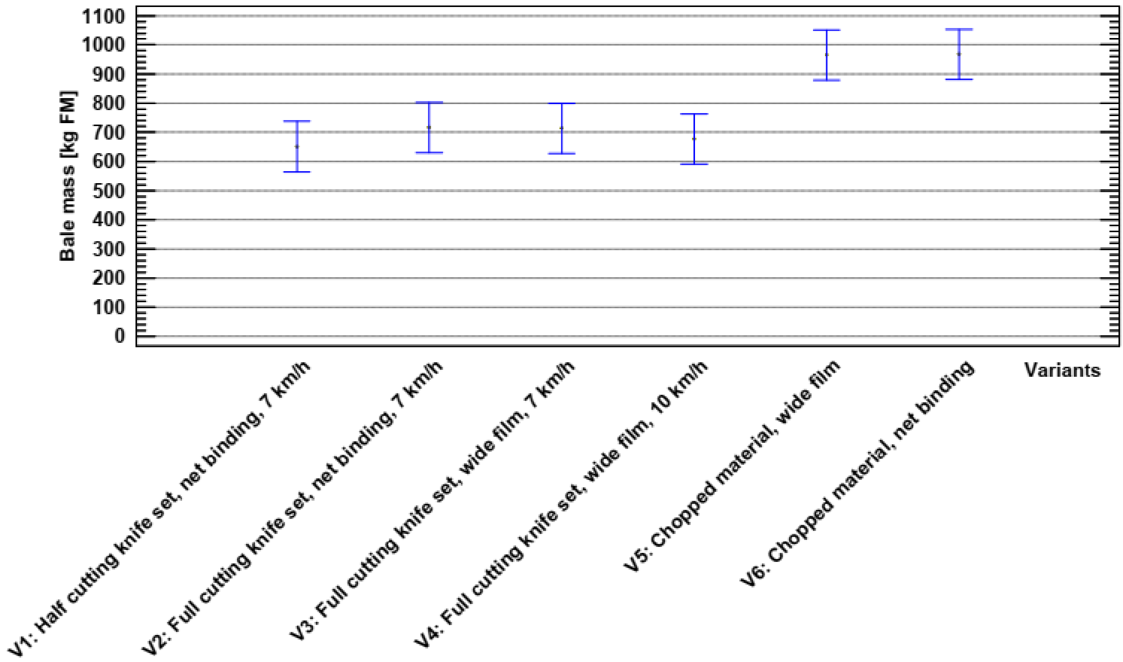

Figure 8: Mass (fresh matter) of the bales for the individual variants

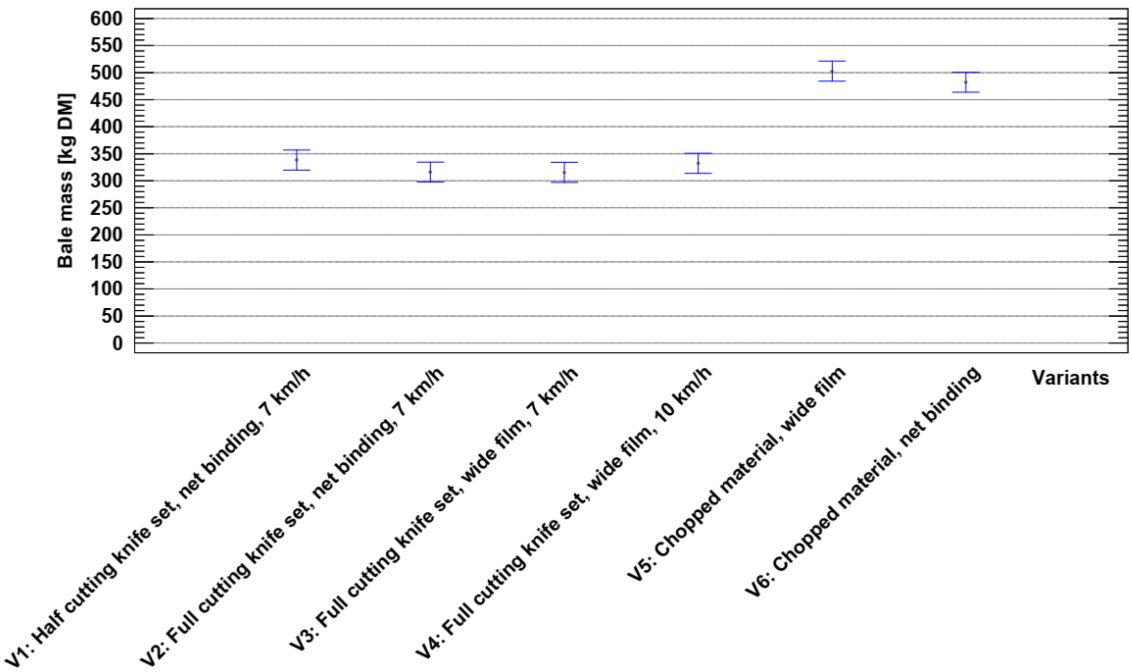

Figure 9: Mass (dry matter) of the bales for the individual variants

3.4 Bale density

With regard to the bale density, the bales from the G-1 F125 Kombi were found to differ significantly from those from the VARIO-Master V140 with an average dry matter content on the basis of a multi-factor analysis of variance, which took the dry matter content into account as a covariate. Figure 10 summarizes the results of the Tukey HSD test. As described in section 3.3, reasons for this could be the type of baler and the forage cutting length. There were no significant differences between the bales from the same baler. With the G-1 F125 Kombi, the bale density[1] tended to be higher for the V2 (185 kg DM/m³) and V3 (182 kg DM/m³) variants that were cut shorter than for variant V1 (177 kg DM/m³). The slight fall in variant V4 (177 kg DM/m³) compared to variants V2 and V3 may have been caused by the higher mass flow rate.

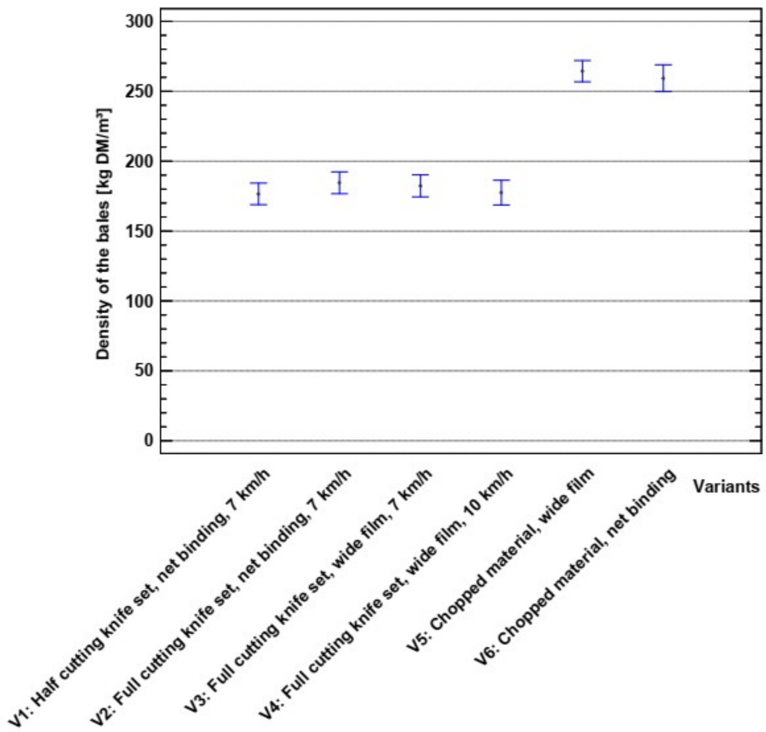

Figure 10: Density (dry matter) of the bales for the individual variants

[1] The values in brackets are averages

3.5 Power requirements at the tractor PTO shaft

The average power requirements at the PTO shaft consist of the average value of the power requirements from the start to the end of the baling process for one bale. Interruptions in work are not included. The results of a Tukey HSD test summarized in Figure 11 show that the variant with the half cutting knife set (V1) had significantly lower average power requirements than the other variants. Variants V2, V3 and V4 did not differ significantly from one another, although variant V4 did tend to have high power requirements with its significantly higher mass flow rate (see Figure 6). Variants V5 and V6 did not differ significantly from one another or from variant V4. The difference from V1, V2, and V3 was significant.

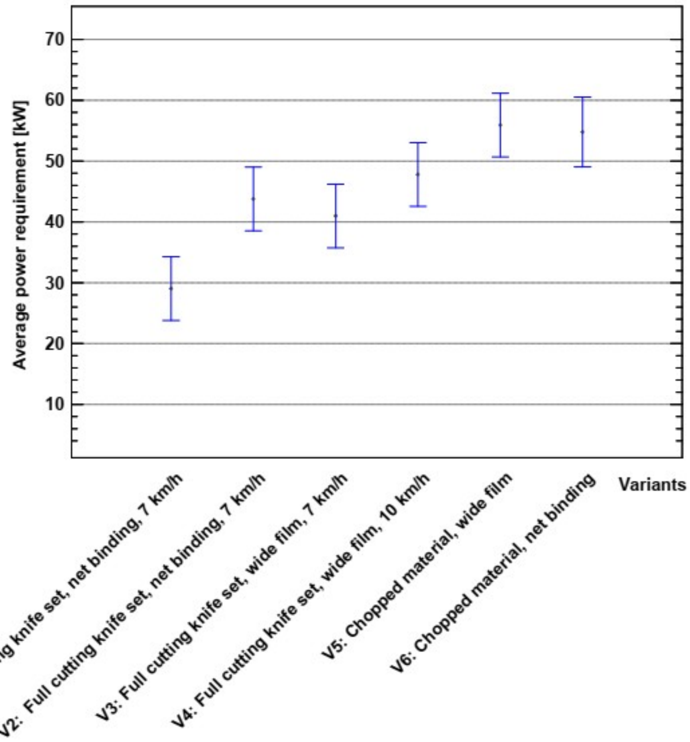

Figure 11: Average power requirements at the tractor PTO shaft

According to the results of a Tukey HSD test summarized in Figure 12, variants V1, V5 and V6 did not differ significantly in terms of the maximum power requirements, although the value for variant V1 was around 10 kW lower on average. Significantly higher maximum power requirements were found with variants V2, V3, and V4 compared to variants V1, V5, and V6. Variant V4 generally differed from variants V2 and V3 here with the higher mass flow rate during baling.

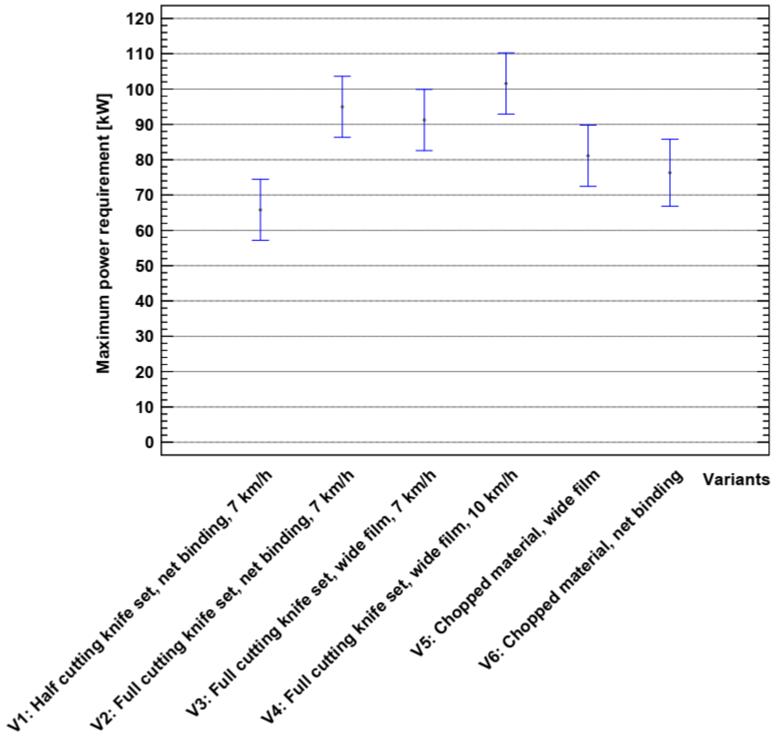

Figure 12: Maximum power requirements at the tractor PTO shaft

Figure 13 shows the development of the power requirements at the PTO shaft of the G-1 F125 Kombi for the baling of one bale. The power requirements rose continuously until the end of baling, which is typical of a fixed chamber baler. This was followed by the binding of the bale with wide film and the transfer of the bale to the wrapping device and

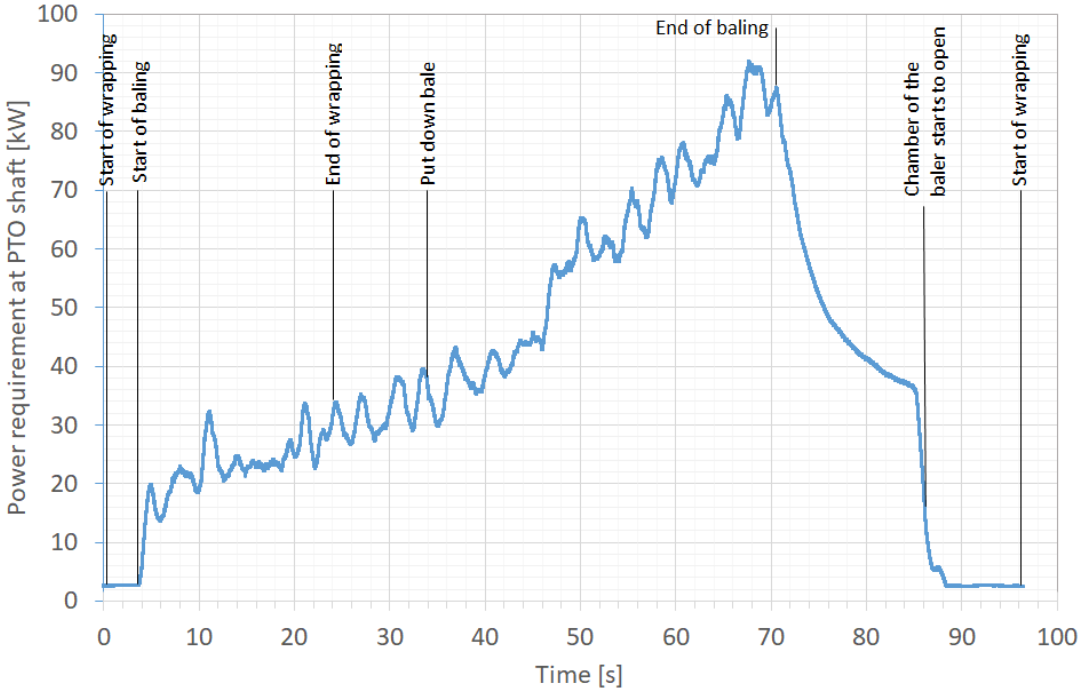

Figure 13: Example of the development of the power requirements at the PTO shaft of the G-1 F125 Kombi in variant V3 for one bale

the start of the wrapping process. While one bale was being pressed, the previous bale was being wrapped. The times for the start and end of wrapping and the end of the bale being deposited were recorded. The no-load power requirements were around 2.4 kW.

Figure 14 shows an example of the development of the power requirements at the PTO shaft for the baling and wrapping of three bales using the VARIO-Master V140 in variant V6. The no-load power requirements in the first 40 seconds of the measurements were 6.2 kW. When filling of the bale chamber commenced, the power requirements increased before reaching a plateau at 130 seconds. This development is typical of balers with a variable bale chamber. A malfunction occurred at the end of the baling process, which meant that binding was delayed. Once the bale was transferred to the wrapping device, the wrapping process and the baling of the next bale started simultaneously. The wrapping of the first and second bales was completed before the power plateau point was reached during the baling of the second and third bales. After the baling of the third bale, a malfunction occurred lasting around 20 seconds before the net binding of the bale was carried out. No further bales were baled while the third bale was being wrapped.

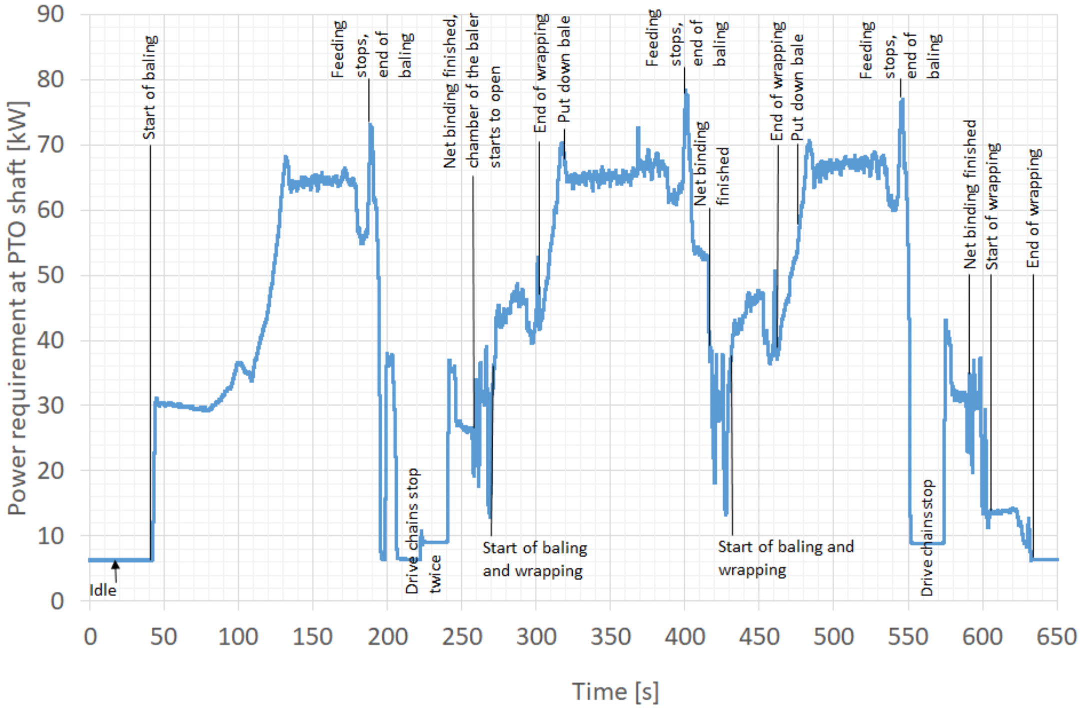

Figure 14: Example of the development of the power requirements at the PTO shaft for the baling and wrapping of three bales using the VARIO-Master V140 in variant V6

3.6 Silage cutting length

Figure 15 shows the cumulative percentages of different lengths over the item length ("grading curve"). For example, with variant V1 40% of the combined total length of all measured particles of items was from particles that were shorter than 50 mm. With variants V2 to V4, this percentage was reached much earlier for a particle length of around 35 mm.

There are clear differences between the V1 (half cutting knife set), V2 to V4 (full cutting knife set), and V5 to V6 (shredded silage) variants. There is no discernible difference in the particle length distribution between the individual variants with the full cutting knife set (V2–V4). With these variants, the theoretical cutting length has clearly been successfully achieved, as shown by the sharp increase at around 37 mm. With the half cutting knife set, a slightly higher increase in the curve can be seen at around 80 mm. The 4 mm theoretical cutting length of the chopped material is close to the detection limit of the optical measuring system and is therefore not visible in the curve. With the chopped material, more than 90% of the particle lengths were shorter than 35 mm.

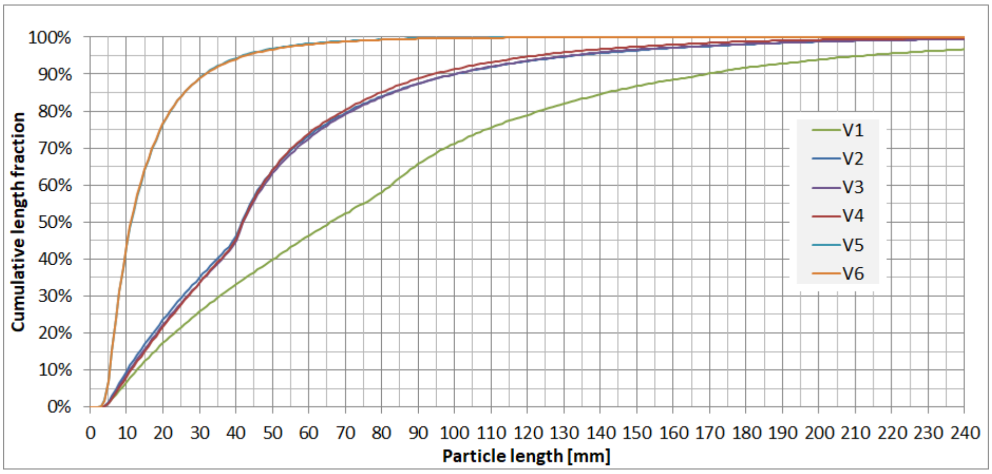

Figure 15: Distribution of the particle lengths in the silage bales of the individual variants

3.7 Silage quality

The dry matter content of the silage was very high at 48.6% on average due to the weather conditions during the test. At 162 g/kg DM, the average raw protein content was within the recommended range for regrowth specified by the Austrian working group for the grassland and livestock industry (ÖAG). A value between 220 and 260 g/kg DM is recommended by the ÖAG for the fiber content. During the test, it was above this range at

327 g/kg DM. The crude ash content, which is a measure of forage contamination, was below the threshold of 110 g/kg DM at 103 g/kg DM. The average net energy lactation contained was below the amount recommended by the ÖAG at 5.3 MJ/kg DM due to the high fiber content. The Kruskal-Wallis tests carried out for the individual variants showed no statistically significant differences between the medians of the variants with a 95.0% confidence level.

The fermentation quality according to DLG 2006 [DLG 2006] is determined on the basis of a rating scheme that takes into account the butyric acid and acetic acid content, as well as the pH value of the silage samples. The rating scheme ranges from 1 (very good) to 5 (very poor). All of the samples taken in the test were evaluated as 1 (very good) or 2 (good). A Kruskal-Wallis test that was performed showed no statistically significant differences between the medians of the variants with a 95.0% confidence level (see Figure 16). The variants did not differ significantly in terms of their pH value or acetic acid content either.

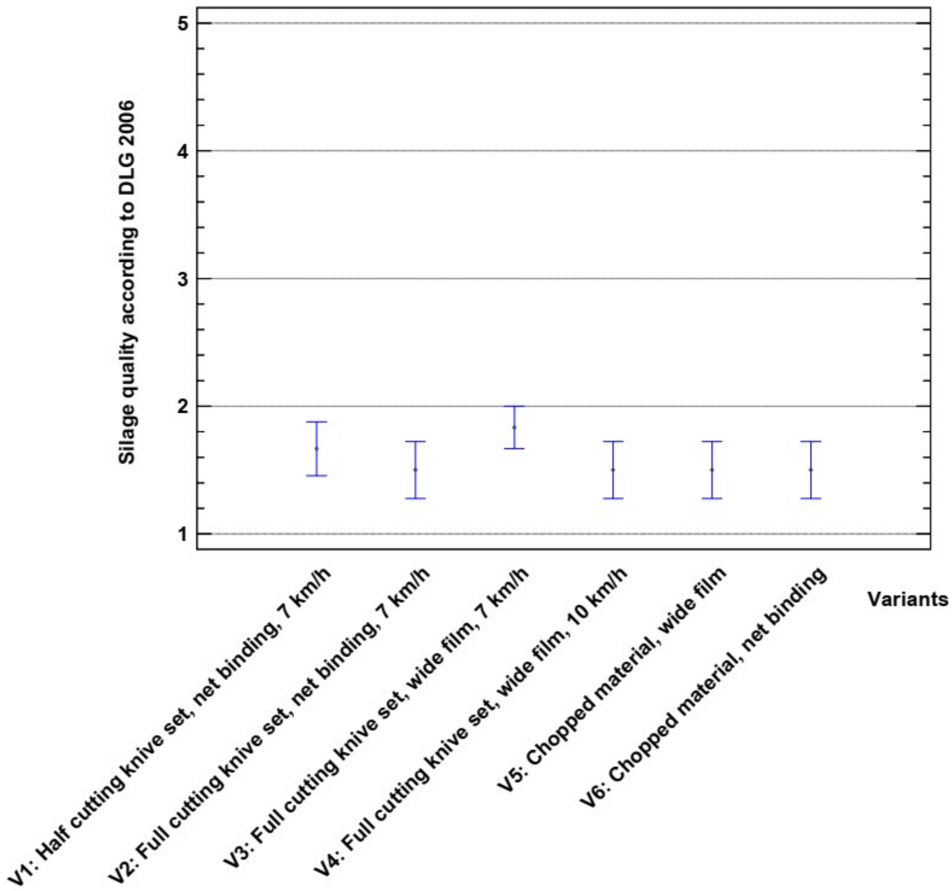

Figure 16: Fermentation quality according to DLG 2006 for the individual variants

The pH value was 4.8 on average. The average acetic acid content was 12 g/kg DM and was therefore within the range recommended by the ÖAG of 10–25 g/kg DM. According to the ÖAG, the butyric acid content should be below 3 g/kg DM. Here, the Kruskal-Wallis test showed a statistically significant lower value for the bales from the VARIO-Master V140 (0.1 g/kg DM) than for those from the G-1 F125 (1.8 g/kg DM). But in both cases, the threshold was not exceeded.

Under the framework conditions of the test carried out, no significant difference in the silage quality could be found between the bales bound with net and those bound with wide film.

3.8 Differences in the productivity

In addition to the mass flow rate in the bale chamber during the baling process (see section 3.1), the required time between the end of the baling process of a bale and the start of the baling process for the next bale has a significant impact on the impact force of the baler-wrapper combination. The time between the baling process for two bales is required for binding and the transfer of the bale to the wrapping device. With the G-1 F125 Kombi, the time for backing up and approaching the swath again is also included. Figure 17 summarizes the results of a Tukey HSD test and shows that with the G-1 F125 Kombi (mobile baler) the time required where wide film is used is (0.48 min. per bale) is significantly higher than where net binding is used (0.42 min. per bale). With the VARIO-Master V140 (stationary baler), the same trend can be seen (0.48 to 0.54 min per bale),

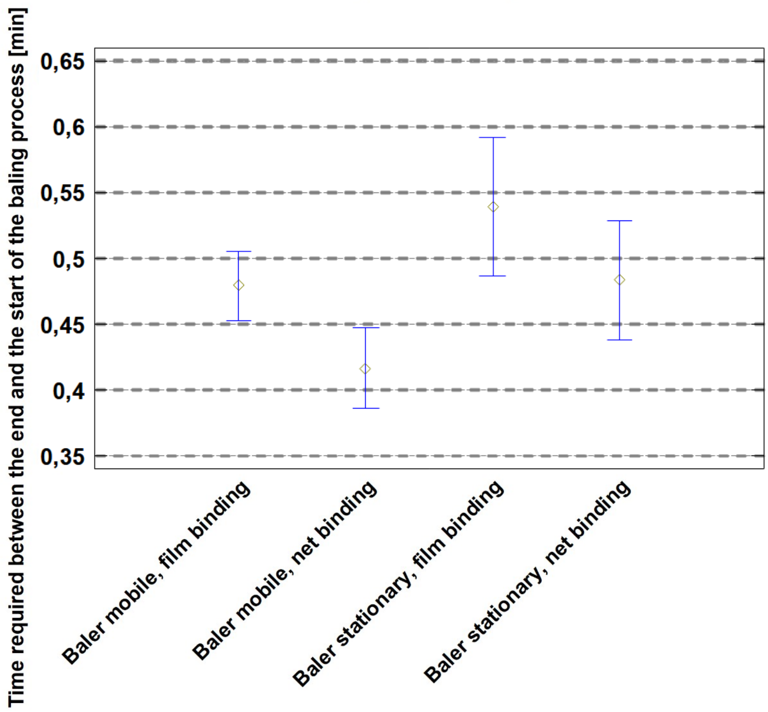

Figure 17: Time required between the end and start of the baling process

but the difference is not significant. There is also a significant difference between a mobile baler with net binding and a stationary baler with wide film.

Table 1: Impact of the time required between the end and start of the baling process on the area performance of the baler-wrapper combination

	Mobile baler with net binding	Mobile baler with film binding	Station-ary baler with net binding	Station-ary baler with film binding
Field size [ha]	5,0	5,0	5,0	5,0
Yield [t DM/ha]	3,0	3,0	3,0	3,0
Yield [t DM/field]	15,0	15,0	15,0	15,0
Time between the end and start of the baling process [min.]	0,42	0,48	0,48	0,54
Bale diameter [cm]	136	136	136	136
Bale width [cm]	125	125	125	125
Bale volume [m³]	1,81	1,81	1,81	1,81
Bale density [kg DM/m³]	180	180	260	260
Bale weight [kg DM]	327	327	472	472
Number of bales per field	45,9	45,9	31,8	31,8
Mass flow rate during baling [t DM/h]	15,0	15,0	15,0	15,0
Baling time per field [min.]	60,00	60,00	60,00	60,00
Time between the end and start of the baling process per field [min.]	19,28	22,04	15,26	17,17
Time to perform the work per field [min.]	79,28	82,04	75,26	77,17
Area performance in the time to perform the work [ha/h]	3,8	3,7	4,0	3,9
Relative area performance in the time to perform the work [%]	100	97	105	103

Table 1 shows an example of the impact of the time required between the end and start of the baling process on the area performance and therefore on the impact force of the baler-wrapper combination. In the example, a 5 ha field with a yield of 3.0 t DM/ha is assumed. The bale volume, the bale density and the mass flow rate during the baling process correspond roughly to the values obtained during the tests. The calculated time taken to perform the work only includes the time required to complete the silage bales. Turning times, set-up times, other idle times and periods of disruption are not included. The relative area performance in the time taken to perform the work in the last row shows that the area performance with the mobile baler-wrapper combination falls by 3% where wide film is used. Although the stationary baler-wrapper combination with wide film shows the highest amount of time required between the bales, the area performance rises by 3% compared to the mobile baler-wrapper combination with net binding due to the lower number of bales.

4 Summary

The investigations were carried out using the G-1 F125 Kombi and VARIO-Master V140 baler-wrapper combinations.

The investigation's central questions can be answered as follows:

- What impact does the number of cutting knives in the round baler's cutting device (silage cutting length) have on bale density and the baler-wrapper combination's power requirements at the tractor PTO shaft?

  With the G-1 F125 Kombi, the reduction in the number of knives to the half cutting knife set brought about a reduction in the bale density of around 6 kg DM/m³. An increase in the mass flow rate as a result of increasing the driving speed from 7 to 10 km/h with a full set of knives brought about a similar reduction. None of the differences were statistically significant.

  With the G-1 F125 Kombi with the half cutting knife set, the average power requirements at the PTO shaft were significantly lower than with the full cutting knife set. With the full cutting knife set, the significant rise in the mass flow rate as a result of increasing the driving speed from 7 to 10 km/h led to a rise in the average power requirements. But the difference was not statistically significant.

  Compared to the half cutting knife set, the full cutting knife set brought about a significant rise in the maximum power requirements, with the 10 km/h variant showing the highest maximum power requirements.

- What impact do the driving speed and the mass flow rate in the round baler have on bale density, the power requirements at the tractor PTO shaft, and the impact force of the baler-wrapper combination?

  With the G-1 F125 Kombi, the increase in the mass flow rate as a result of increasing the driving speed from 7 to 10 km/h with a full set of knives led to a non-significant reduction in the bale density of around 6 kg DM/m³.

  The average power requirements at the PTO shaft of the G-1 F125 Kombi with the full cutting knife set rose as a result of the significant rise in the mass flow rate as a consequence of increasing the driving speed from 7 to 10 km/h. But the difference was not statistically significant. The same also applied to the maximum power requirements.

The times required for binding the bale and the transfer of the bale to the wrapping device were significantly higher for both baling processes with wide film than with net binding. In addition to having an impact on the mass flow rate during baling, this also affected the impact force of the balers.

- How does the quality of the silage change if a wide film is used for the round bales instead of net binding?

  Whether the bales were bound with net or wide film did not have any impact on the silage quality as evaluated using the DLG scheme. For all variants, the silage quality was assessed as being between very good and good.

- How does the G-1 F125 Kombi baler-wrapper combination differ from the VARIO-Master V140 in terms of power requirements, mass flow, bale density and feed quality?

  In terms of the mass flow rate during the baling process, the G-1 F125 Kombi did not differ significantly from the VARIO-Master V140 for the 7 km/h variant. The mass flow rate of the G-1 F125 Kombi was significantly higher at a driving speed of 10 km/h.

  The bales from the VARIO-Master V140 showed a significantly higher density. The difference was around 80 kg DM/m³.

  Compared to the 7 km/h variants of the G-1 F125 Kombi, the VARIO-Master V140 had significantly higher average power requirements. The difference from the 10 km/h variant was not significant. The VARIO-Master V140 did not differ significantly from the G-1 F125 Kombi with a half cutting knife set in terms of their maximum power requirements. With the full cutting knife set, the G-1 F125 had significantly higher maximum power requirements.

  In terms of the silage quality according to the DLG rating scheme, there were no significant differences. For both types, the silage quality was assessed as being between very good and good. The only finding was that the bales from the VARIO-Master V140 had a much lower butyric acid content than the bales from the G-1 F125

Kombi, although the latter were still 40% below the ÖAG recommended value on average.

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Bibliography

DLG (2006): Grobfutterbewertung - Teil B - DLG-Schlüssel zur Beurteilung der Gärqualität von Grünfuttersilagen auf Basis der chemischen Untersuchung. [Coarse fodder evaluation - Part B - DLG key for assessing the fermentation quality of green fodder silage on the basis of chemical testing] DLG-Information 2/2006, DLG e.V., 60489 Frankfurt/M., 2006.

Abbreviations

DM	Dry matter
FM	Fresh matter

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