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Signed: Birgit Rasmanen

Date: July 12, 2019
RESEARCH INTO
HANDSPINNING OF
ANGORA YARNS
TO MINIMIZE
SHEDDING
RESEARCH INTO
HANDSPINNING OF
ANGORA YARNS TO
MINIMIZE SHEDDING

This indepth study is presented as a partial requirement
for the Master Spinners Certificate
at Olds College, Olds, Alberta, Canada

July 1997
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Summary

This is a study on spinning yarns from combed, plucked or sheared angora fibers from English and
Giant Angora rabbits in order to minimize the shedding of fibers in the finished item.

This research has shown that to make a quality angora yarn and a finished item with minimal
shedding it is best to use long sheared angora fibers from the Giant Angora rabbit or plucked angora
fibers from the English Angora rabbit.

This is also a study on giving the handspun yarns different amounts of twist per inch in order to
minimize the shedding of fibers in the finished item.

The more twist an angora yarn is given, the less shedding there is in the finished item, but too much
twist of the yarn results in less fuzziness or less furliness.

A comparison of combed, plucked or sheared angora fibers from the same English Angora rabbit
has also been carried out.

This comparison has shown that when spinning fibers from the same English Angora rabbit, it is best
to use plucked fibers instead of sheared fibers.

The plucked English angora fibers when spun into a yarn shed very little or hardly at all. The
sheared English angora fibers when spun into a yarn shed quite a lot.

All the different kinds of angora fibers were also carded with Merino wool top and spun into yarns
using a 50 % angora/ 50 % wool blend.

Blending the angora fibers with Merino wool top, did very little or nothing at all in changing the
shedding factor of the handspun angora/wool yarns, when comparing them with the handspun 100 %
angora yarns.
Introduction.

Some people say, that items made from angora yarn shed a lot, and they would not buy or use angora anymore. They usually think of items made during the second world war, or items made from a poor quality angora.

Items made from a good quality angora shed only a little or hardly at all, if the yarn is given the right amount of twist in the spinning process.

This research has been done for the purpose of determining the amount of twist that is required in yarn spun from angora fibers to minimize shedding in the finished item.

A comparison of fibers from English and Giant Angora rabbits which have been combed, plucked or sheared have also been carried out.

A blend of 50 % angora fibers and 50 % Merino wool top has been spun into yarns, which have been compared with the 100 % angora yarns spun from the different kinds of angora fibers used in this study.

The findings of this report will help other spinners when they are spinning angora yarn, so they will end up with a satisfactory result. The yarn can be made into a project, that will be lovely to use and shed as little as possible for that particular kind of angora fiber.
Angora rabbit breeds

When talking about spinning of angora, one have to think of the different breeds of Angora rabbits, and also of the methods used to harvest the fibers, either by plucking, combing or shearing.

The breeds of Angora rabbits are as follows:

- English Angora
- French Angora
- German Angora
- Giant Angora
- Satin Angora

The names of the first 3 mentioned refer to the places where that particular rabbit was selected and bred for certain characteristics in size of animal or the length and quality of the angora fiber.

It is not certain where the Angora rabbit originated, but most sources claim, that it came from Turkey. (Lynne 6).

English people claim to have found the Angora rabbit in Turkey and brought it back to Britain, where the fiber soon became very popular in the textile industry. (Lynne 6,7).

In 1723, English sailors brought some Angora rabbits to France, and the production of French Angora rabbits became very popular. (Lynne 6).

In the latter part of the nineteenth century in France Mme. Lard wrote: "My angora rabbits are pure white or gray-black. Every three months their silky fur is combed off, carded and spun on a great wheel. I give the yarn to school girls who, in their spare time or while tending flocks of sheep or goats, knit many angora item such as gloves, stocking, slippers, knee warmers, shirt fronts, etc. I visit the girls regularly and encourage their work with a wage proportional to the difficulty of the knitted item and their skill in knitting. These silky angora garments are excellent. The doctors recommend them for rheumatism and other ailments of this nature, as well as for people with weak and delicate natures. It is softer and warmer than woolen flannel. I sell these garments to tourists visiting the thermal springs at Aix." (Lynne 7).
From France Angora rabbits were exported to Germany and other places in the world.

There are differences in the fibers on the different breeds of Angora rabbits.

The following is a general description, but of course there can be exceptions within the breed:

- **English Angora** fibers are the finest in diameter and have the fewest guardhairs. Items made from English angora yarn have a halo of fluff. English angora fibers felt very easily.

- **French Angora** fibers are more substantial than English angora fibers, usually with a larger amount of guardhairs.

  The guardhairs support the loft and fluff of the angora, and also help to reduce felting. French angora yarn is furry or "spiky" looking and is the most lustrous of the angora fibers.

- **German Angora** fibers are halfway between English angora and French angora fibers in regards to fiber diameter and amount of guardhair.

  Items made from German angora look furry just like the angora from French Angora rabbits.

  (Lynne 29).

- **Giant Angora** fibers are longer than the other kinds of angora fibers.

  The Giant Angora rabbit produce the largest amount of fibers per animal of all the angora rabbit breeds. The Giant angora fibers are produced for commercial use.

  Because of the dense coat the fibers from the Giant Angora rabbit are almost always sheared.

- **Satin Angora** fibers are soft, and woolly with lots of especially lustrous guardhairs. (Spin-Off 80, 1994).

  The breed of Satin Angora rabbits were developed in Canada and recognized as a breed in 1987. It is a cross between French Angora rabbits and a Satin breed (short haired rabbit). (Spin-Off 85, 1994).

  The Satin angora fibers are more slippery to spin than fibers from other angora breeds. The fibers
felt easily. (Spin-Off 87, 1994).

Angora fibers from China dominates the world market at the moment.

Angora from China is considered inferior to that of fibers from other sources. Those angora fibers tend to be finer, softer and shorter, and are nearly always blended with other fibers as they are not long and strong enough to be used alone.

Unfortunately the angora fibers from China shed very badly, and items made from this angora yarn give the whole angora industry a bad reputation for shedding. (Lynne 9).
Analysis of the Angora fiber

The coat of an Angora rabbit consists of 4 different types of fibers: Guardhair

Awn hair

Awn wool

Underwool

- **Guardhairs** are strong and thick. They are usually straight hairs, which are longer than the rest of the fibers. They form a protective shield over the rest of the fibers.

The internal structure of a guardhair consists of an average of 3 - 6 medullary cells across the hair, and is enclosed by a relatively thick cortex. The scales on the cuticle are flattened and smooth.

Individual rabbits have different amounts of guardhair. Some rabbits have hardly any guardhairs and others have a lot.

- **Awn hairs** are shorter than guardhairs. The awn hair has an awn tip, a hair-like projection which is fashioned like a tiny window awning, slightly crescent shaped. The awn tip is 1/2" or less in length.

The awn tip has a habit of breaking off, where the hair becomes straight. These awn tips represent a great percentage of the shedded angora fibers.

- **Awn wool** is shorter than awn hair, but a little longer than the underwool.

The awn wool also has an awn tip, which can break off.

- **Underwool** is the most insulative and the softest of the 4 fiber types. This fiber has one medullary cell across in the width, and has various thicknesses of the cortex.

The underwool is the most abundant fiber on the rabbit.

The underwool fiber has well-ordered conspicuous scales, which is an advantage in felting angora. (Kilfoyle & Samson 106, 113).

The angora fibers are made of mostly keratin. Keratin is relatively resistant to acids, but will easily be damaged by alkalis and oxidants.
The keratin in the fiber can absorb up to 33% of its own weight of water. Angora fiber feels warm, dry and comfortable even after absorbing water.

In the middle of the angora fiber is the medulla (a hollow core). This medulla helps to give the angora fiber its special characteristics, which affects the warmth, weight, dyeability and appearance of angora.

The medullar cells help to make angora very warm, but do not make it heavy. Some studies suggest, that angora is 8 times warmer than wool, if yarns of the same weight are compared. (Lynne 14).

The four types of Angora fibers are arranged orderly in groups on the rabbit.

For instance: 1 guardhair

flanked by 2 awn hairs

surrounded by 6 follicles, which produce both awn wool and underwool fibers

The appearance of different fiber types are very different over the entire body of the rabbit. (Lynne 106).

Both guardhairs and awn hairs are usually referred to as guardhairs. These hairs cover the underwool on the rabbit. Some people do not like guardhairs in the angora fibers, but they help to make the angora yarn stronger, and they also help to prevent angora from felting so easily.

The ends of the guardhairs sticks out of the spun yarn, so it looks "spiky".

Together with the underwool the guardhairs form the halo of fluff, which characterizes a quality handspun angora yarn. (Lynne 12, 13).

The hairiest wool is along the top and the sides of the rabbit. The shortest fibers are found on the rump of the rabbit. The wool on the chest and belly of the rabbit is usually very crimpy and shorter than other places on the body of the rabbit. (Lynne 114).

Good nutrition is necessary for a good hair growth on the rabbit. Poor nutrition will delay shedding of the fibers and hair replacement. Insufficient and poor nutrition will give a lower fiber production on the rabbit.
Each rabbit has in its genes the limit on its maximum fiber production. (Lynne 24).

The Thyroid hormones stimulates anagen in the hair follicles. Stress hormones interfere with the production of fibers, so rabbits should be kept healthy and stressfree to ensure a good production of fibers.

Another group of hormones, which decreases production of fibers, are the male and female sex hormones. Some male rabbits are castrated to keep up their fiber production. Female rabbits, that produce many litters of babies have reduced production of fibers. Stress during the birth of the litter will also affect production and the quality of the fibers.

Removal of the hair shaft by plucking also stimulates the production of new hair fibers. Because of the ability of the cells in the hair bulb to multiply, plucking of the fiber does not keep new hair from growing. Plucking actually promotes more growth. (Lynne 24, 25).

Hair replacement on the rabbit occurs in small patches on the rabbit's body, because each hair follicle produces and replaces the hair independently of each other.

Angora rabbit raisers have noticed, that in order to pluck a rabbit completely, it will have to be plucked over several days or weeks, because of the rate which the hair follicles replaces the hairs. This is called asynchronous follicular activity. Regular plucking at the right time, helps to shorten the time between the growth of the new hair, but also helps to restore follicular synchrony (which baby rabbits have in the first few months of their life), so a larger amount of fiber can be plucked off at one time. This will be more convenient for the rabbit raiser.

Shearing of the angora fiber does not interfere with the follicular activity, which means that it does not shorten or lengthen the time between the hair growth.

Because the follicles are producing hair at different stages of growth, shearing will cut off shorter fibers also. (Lynne 25).
Harvesting of Angora fibers

The longest and the best fibers are produced by a mature rabbit.

The Angora fibers can be harvested by:  Plucking

Combing

Shearing

- **Plucking** of Angora at the time of maturity and shedding, produce the longest and finest fibers.

The fibers are removed by the roots.

The longest fibers help the stability of the yarn. Plucked angora fibers produce a yarn which sheds very little.

The action of plucking stimulates the new hair to grow. Subsequent fleeces will have the same structure and quality as the first plucked fibers. (Lynne 28). Plucked angora can easily be spun without carding.

- **Combing** also removes the fibers by the roots, but by using a comb the fibers get tangled, and that makes it more difficult to draft while spinning. It is recommended to card the combed angora before spinning it to make a smoother yarn.

- **Shearing** of the rabbit removes the fibers nicely as a lock. The fibers will look a lot like the fibers from plucking with some exceptions. The fibers will be shorter and without the root ends of the fibers. "Second cuts" and short new hair will be mixed with the longer hair in the fleece.

Second and subsequent fleeces sheared from the same rabbit will be much different. The hairs will grow and mature at different times. Shorter guardhairs will have their tips removed during the shearing of one fleece and then the next shearing will produce the guardhairs without the tips. There will be a lot of short fibers in the fleece, which may result in more shedding. (Lynne 29).

The fibers on the German and Giant Angora rabbits are usually sheared off.
Preparing the fibers for spinning

Angora fibers do not need to be washed before spinning and if using plucked angora can be spun into a smooth yarn without carding.

Angora yarn spun from plucked angora fibers is strong, durable, as well as light and fluffy. The yarn will have a halo of fluff. (Lynne 36).

Combed angora fibers can also be spun without carding, but the yarn will not be as smooth and even as the yarn produced from plucked angora fibers. Yarn from combed angora will also be fluffy. Shorn angora fibers of high quality and long fibers can be spun without carding, but the yarn will be a lot different than yarn spun from plucked angora fibers. Cut ends will stick out of the yarn spun from uncarded shorn angora fibers. (Lynne 37).

Spinning of carded angora fibers results in a yarn which is less substantial and loftier, but not as furry. The short fibers in carded and sheared angora may shed.

Carding of Angora fibers

It is possible to spin an even, smooth yarn from combed and sheared angora without carding, but it is recommended to give the fibers a light carding. For the best result it is recommended to use carders with fine and closely set teeth. (Lynne 37).

Card angora fibers very gently and not very much, as the fibers are very delicate. Remember to card only a small amount at the time to make a thin rolag. Putting too much angora fibers on the carders at one time, can get the fibers all tangled.

Spinning of Angora fibers.

When spinning angora fibers one has to think about the fact that angora has very little elasticity. Do not spin angora yarn with a large grist, or the finished item will sag in use, because it will be too heavy.

Angora yarn can be spun thin and still be very warm.
Single spun angora is not strong enough to use without plying. It is best to spin angora into at least a 2 ply yarn, because plying adds strength and also elasticity to the yarn.

A 3 ply yarn will give more body to a knitted item. (Lynne 41, 42).

There must be enough twist spun into the angora yarn to hold the fibers together. More twist will give the yarn more strength.

Usually a heavy yarn needs less twist than a fine yarn. An angora yarn with little twist feels softer than one with a lot of twist. Also a high twisted yarn is a lot smoother and stronger than a low twisted yarn. (Lynne 43).

Erica Lynne says: "For general guidelines, you may consider the following information on twist in pure angora yarns. My heaviest yarn has 4 to 5 twists per inch (t.p.i.) in the singles and is plied at 2 t.p.i. The finer plied yarn has 8 to 9 t.p.i. in the singles and 4 in the ply respectively. The single-ply yarn has less twist, about 3 t.p.i.

These figures are for yarn spun from prime plucked angora. For carded fiber, the twist can be reduced because the irregular fiber arrangement provides more friction than the parallel arrangement of the plucked fiber. Commercial angora yarn, which is spun with the minimum amount of twist possible, is as low as 1 t.p.i." (Lynne 43).

Angora can be spun on spinning wheels with a slow take-up, or on a handspindle. A handspindle for angora spinning has to be lightweight and well balanced. (Lynne 44).

Spin angora fibers with a loose tension on the wheel. Be very gentle when working with angora fibers. Angora yarns are not fluffy looking when they are first spun. The ends of the fibers begin to stick out of the yarn, while it is being made into a finished item. This is characteristic for a quality spun angora. (Lynne 45).

When washing angora yarn, do not dry it under tension as it will stretch and ruin the little elasticity that angora has.
When spinning angora fibers it is a good idea to cover the lap with a big piece of fabric, so the loose fly away fibers can be kept at one place. It is then easy to fold the fabric around the fibers if the spinner has to stop spinning quickly for instance to answer the phone. (Lynne 46).
Discussion

The angora fibers used in this research are from a couple of friends' rabbits and also from my own rabbits.

The harvesting of combed and plucked angora fibers is much more time consuming than the harvesting of sheared angora fibers. Combing and plucking of a rabbit can take up to 45 - 60 minutes per rabbit. When combing and plucking the fibers off a rabbit, only a small amount of fibers can be harvested at one time, actually only the fibers which are ripe and ready to be shed. A person has to comb and pluck the rabbit several times to get enough fibers to start a project. When shearing the fibers off a rabbit, a person can shear off the whole fleece of the rabbit at one time, and thus get enough fibers quickly to start a project.

The following kinds of angora fibers have been used:

1. Sheared Angora from a white Giant Angora rabbit
2. Sheared Angora from a grey English angora rabbit
3. Combed Angora from a white English Angora rabbit
4. Plucked Angora from a beige English Angora rabbit
5. Sheared Angora from a beige English Angora rabbit
6. Plucked Angora from the same beige English Angora rabbit as # 5.

It is noted, that plucked fibers from a Giant Angora rabbit has not been used. The reason is that it is very difficult to get any amount of fiber from this breed by combing and plucking as they generally shed very little.

All of the angora fibers were lightly carded on fine teeth carders for comparison reasons, even though it was not necessary to card the plucked angora fibers, which can be spun easily as it comes from the rabbit.

From each of the first 4 different kinds of angora fibers 5 skeins were spun with different amounts of twist. The goal was to give one skein of each angora fiber the same amount of twist or as close a
twist as possible as the skeins from the other angora fibers.

The 5 skeins of angora were spun as 2-ply yarns with the following amounts of twist:

1. approx. 3 t.p.i. (plyed)
2. approx. 4 t.p.i. (plyed)
3. approx. 5 t.p.i. (plyed)
4. approx. 6 t.p.i. (plyed)
5. approx. 7 - 8 t.p.i. (plyed).

Because of the low ratio of the Wee Peggy spinning wheel, which was used, only yarns with up to 7 - 8 t.p.i. in the ply were spun. When comparing these different twisted yarns, it is seen that, if a yarn is given more than 7 t.p.i. in the ply, some of the fuzziness will be compromised, resulting in a less fuzzy or less furry looking finished item.

Merino wool top was carded together with these 4 different kinds of angora fibers to give a blend of 50 % angora/50 % wool. A skein was spun of each blending with approx. 5 t.p.i. in the ply.

Spinning of the sheared angora fibers is more difficult than spinning of combed and plucked angora fibers, because the sheared fibers are very short.

Spinning of angora fibers is in general more difficult and takes more time than spinning of wool fibers, because the angora fibers are more "slippery". The blend of 50 % angora fibers and 50 % merino wool top is easier to spin than the 100 % angora fibers, because the wool in the blend makes it less "slippery". Blending the short sheared angora fibers with wool also makes it easier to spin, than the 100 % sheared angora fibers, and the short angora fibers do not seem to be so fly-away with this blend.

One skein of both sheared and plucked angora fibers from the same English Angora rabbit was spun with the same amount of twist or as close a twist as possible (approx. 5 t.p.i.) in the ply.
The 100% angora fibers which were plucked were much easier to spin than the shorter sheared angora fibers. Blending the sheared fibers with Merino wool top made it much easier to spin. The short sheared fibers from the English Angora rabbit were quite fly-away and they bothered my face a little while spinning them, but I did not moisten the fibers during the spinning process. Maybe moistening of the angora fibers by misting with water could be done to control the fly-away fibers. Blending angora fibers with wool gives the yarn much more elasticity than a 100% angora yarn.

The skeins were spun the worsted way to keep the yarn as smooth as possible.

After spinning of the skeins, each skein was rubbed against a piece of dark brown polyester and cotton fabric with 10 strokes back and forth, to see how many guardhairs, awn hair tips, awn wool tips and underwool were shed onto the fabric.

I looked through a magnifying glass to count all the hairs, tips and underwool. The shedded hairs were removed from the piece of fabric with a tweezer onto pieces of double sided tape for each skein and knitted sample. The pieces of double sided tape were attached to sheets of paper. Afterwards I placed a length of foodwrap on top of the tape, to seal it, so no more hairs would get attached. The results were recorded and the paper with the hairs were saved, so the amounts of hairs could be visually compared with the shedded fibers from the other skeins and knitted samples.

Then the skeins were washed in Ivory dish soap and lukewarm water, and rinsed in lukewarm water several times. I prefer to use Ivory dish soap to any other soap as it dissolves easily and it is gentle on the angora. The skeins were dried, laying flat on a towel.

Each skein was then again rubbed against the brown piece of fabric with 10 strokes back and forth, to see how many guardhairs, awn tips and underwool were shed onto the fabric.

A ball was wound from each skein and a sample was knitted from each ball of angora yarn. I wore a dark green apron while knitting, so the shedded fibers were easy to see. The amount of guardhairs, awn tips and underwool shed during the knitting process was recorded.
Each knitted sample was then rubbed against the brown piece of fabric with 10 strokes back and forth, to see how many guardhairs, awn tips and underwool were shed onto the fabric.

When looking at the result of the shedding of the different twisted yarns, it is obvious, that the more twist a yarn is given, the less amount of guardhairs, awn tips and underwool is shed.

The largest amount of the shedded fibers consists of awn tips.

A very large amount of fibers was shed onto the apron, which was worn while knitting the samples, and that resulted in less shedding in the finished knitted sample.

When knitting with yarn spun from sheared English angora fibers, small fibers were flying around in the air and irritating the face of the knitter. An item made from this kind of angora yarn will probably also be irritating for the wearer.

It is seen, that a finished item made from angora yarn spun from plucked English angora fibers shed the smallest amount of fibers. After use and washing the item will only shed very little or hardly at all. (See table # 1).

Because of the large amount of guardhairs and awn hairs in the combed angora fiber samples, the yarns spun from these fibers were shedding a lot of awn tips while knitting the samples, and were still shedding the most fibers in the finished knitted samples.

Blending the angora fibers with Merino wool top did not change much if anything in regard to the shedding of fibers, while knitting and in the finished knitted samples. The Merino wool top made the yarn swell up in grist size during the washing process.

Blending angora with wool makes the handspun yarn stronger, more elastic and it will also wear longer. In the past I have used yarn spun from a blend of angora and wool to knit socks and mittens with. They were very soft and fluffy and they lasted a long time in use.

When comparing the yarn and finished knitted samples from both sheared and plucked angora fibers from the same English Angora rabbit, it is obvious that the yarn spun from the plucked English angora fibers, shed the least amount of fibers of those 2 yarns. (See table # 2).
If using angora fibers from an English Angora rabbit I recommend using only plucked fibers to avoid any disappointment when finishing an item and then finding out that it sheds terribly.

Using angora yarn spun from plucked fibers from English Angora rabbits, I have found that items such as toques, headbands, mittens etc. would get softer, and fuzzier with use and several washes. I have never found any shedded fibers on jackets and coats when wearing the angora items.

The toques and mittens made from plucked English angora fibers shrank a little in use and wash. Studying the shrinking factor of finished angora items may be a topic for future research.
**Conclusion**

The more twist a yarn spun from angora fibers is given, the less shedding there will be in the finished item.

If angora yarn is given more than approx. 7 t.p.i. in the ply the finished item will be less fuzzy or less furry looking.

It is best to use plucked angora fibers from an English Angora rabbit to make a beautiful angora item, which only sheds a little or hardly at all.

The long angora fibers sheared from a Giant Angora rabbit spun into a yarn also make a satisfactory result with very little shedding.

When comparing sheared and plucked angora fibers from the same English Angora rabbit, it is obvious that the yarn spun from the plucked angora fibers shed a lot less than the yarn spun from the sheared angora fibers.

A blend of 50% angora fibers and 50% Merino wool top produces a handspun yarn, which changes only a little or nothing at all in the shedding factor when comparing the blended yarns to the yarns spun from 100% angora fibers.

I recommend using only plucked angora fibers from the English Angora rabbit or sheared angora fibers from the Giant Angora rabbit to spin yarn which will give the best finished result.

I would recommend, that a further study be done on spinning of angora fibers into yarns with more than 7 - 8 t.p.i. in the plyed yarns.

Also a comparison of both plucked and sheared fibers from other breeds could be assessed to see if the results are comparable to the English Angora breed.

A study of the amount of shrinkage and why finished items made from 100% angora yarn or an yarn spun from a blend of angora and wool shrink in use and wash, may be a topic for future research.
Bibliography.


Table # 1.

Comparing different angora yarns with different amounts of twist

While knitting

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<th>6 - 7 t.p.i.</th>
<th>7 - 8 t.p.i.</th>
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<td>2 h, 12 t,</td>
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<td>9 t, 1</td>
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Knitted samples

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</thead>
<tbody>
<tr>
<td>Sheared Giant</td>
<td>6 t, few u</td>
<td>5 t, few u</td>
<td>4 t, less u</td>
<td>2 t, less u</td>
<td>1 t, very few u</td>
</tr>
<tr>
<td>Sheared English</td>
<td>13 t, few u</td>
<td>6 t, few u</td>
<td>1 h, 2 t, few u</td>
<td>1 h, 1 t,</td>
<td>1 t, few u</td>
</tr>
<tr>
<td>Combed English</td>
<td>11 t, few u</td>
<td>9 t, few u</td>
<td>7 t, few u</td>
<td>6 t, few u</td>
<td>5 t, few u</td>
</tr>
<tr>
<td>Plucked English</td>
<td>9 t, few u</td>
<td>3 t, few u</td>
<td>1 h, 3 t, less u</td>
<td>2 t, less u</td>
<td>1 t, less u</td>
</tr>
</tbody>
</table>

h = guardhairs   t = awn tips   u = underwool
Table # 2.

Comparing angora yarn spun from sheared and plucked angora fibers from the same rabbit

<table>
<thead>
<tr>
<th></th>
<th>approx. 5 t.p.i.</th>
<th>50% angora/50% wool (approx. 5 t.p.i.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>While knitting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheared English</td>
<td>75 t, 32 u</td>
<td>40 t, 25 u</td>
</tr>
<tr>
<td>Plucked English</td>
<td>19 t, 11 u</td>
<td>23 t, 10 u</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Knitted samples</strong></th>
<th>approx. 5 t.p.i.</th>
<th>50% angora/50% wool (approx. 5 t.p.i.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheared English</td>
<td>27 t, 30 u</td>
<td>20 t, 24 u</td>
</tr>
<tr>
<td>Plucked English</td>
<td>8 t, 4 u</td>
<td>4 t, 4 u</td>
</tr>
</tbody>
</table>

t = awn tips  
u = underwool
MERINO WOOL TOP
SHEARED GIANT ANGORA

3 t.p.i.
SHEARED GIANT ANGORA
4 t.p.i.
SHEARED GIANT ANGORA
5 t.p.i.
SHEARED GIANT ANGORA
6 t.p.i.
SHEARED GIANT ANGORA
7 - 8 t.p.i.
SHEARED GIANT ANGORA +
MERINO WOOL TOP
50/50 blend
approx. 5 t.p.i.
SHEARED ENGLISH ANGORA
3 t.p.i.
SHEARED ENGLISH ANGORA
4 t.p.i.
SHEARED ENGLISH ANGORA
5 - 6 t.p.i.
SHEARED ENGLISH ANGORA

7 t.p.i.
SHEARED ENGLISH ANGORA
8 t.p.i.
SHEARED ENGLISH ANGORA + MERINO WOOL TOP
50/50 blend
approx. 5 t.p.i.
COMBED ENGLISH ANGORA

$2\frac{1}{2} - 3$ t.p.i.
COMBED ENGLISH ANGORA

3½ t.p.i.
COMBED ENGLISH ANGORA

5 - 6 t.p.i.
COMBED ENGLISH ANGORA

7 t.p.i.
COMBED ENGLISH ANGORA
8 t.p.i.
COMBED ENGLISH ANGORA + MERINO WOOL TOP
50/50 blend
approx. 5 t.p.i.
PLUCKED ENGLISH ANGORA
3 - 3½ t.p.i.
PLUCKED ENGLISH ANGORA

4½ t.p.i.
PLUCKED ENGLISH ANgorA
5 - 5½ t.p.i.
PLUCKED ENGLISH ANGORA
6 - 7 t.p.i.
PLUCKED ENGLISH ANGORA
7 - 8 t.p.i.
PLUCKED ENGLISH ANGORA + MERINO WOOL TOP
50/50 blend
approx. 5 t.p.i.
SHEARED AND PLUCKED ANGORA FIBERS FROM THE SAME ENGLISH ANGORA RABBIT

SHEARED ANGORA FIBERS

PLUCKED ANGORA FIBERS
SHEARED ENGLISH ANGORA
approx. 5 t.p.i.
SHEARED ENGLISH ANGORA + MERINO WOOL TOP
50/50 blend
approx. 5 t.p.i.
PLUCKED ENGLISH ANGORA
approx. 5 t.p.i.
PLUCKED ENGLISH ANGORA + MERINO WOOL TOP
50/50 blend
approx. 5 t.p.i.