

Innovations in Instrumental Insemination

The Compact, Versatile Right & Left Handed Schley Model II Instrument

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Plant and animal breeding are responsible for major advances in agriculture, enhancing economically valued traits as well as minimizing the impact of pests and diseases. Controlled mating is the basic foundation of all stock improvement programs. This has been difficult to control in honey bees because they multiple mate in flight. Instrumental insemination has solved this problem, providing an essential tool.

Today, improvements in techniques and equipment design make this procedure easier to learn and use. A high rate of success and queen performance levels similar to naturally mated queens can be consistently attained.

The ability to control mating enables the selection, development and maintenance of desired traits. If the industry is to benefit from and be able to maintain the speciality "resistant" stocks being developed, this technology must be incorporated into commercial bee breeding programs.

There are a variety of instruments available, which range in cost, quality and

ease of use. The choice can make a difference in the success or frustration of using this procedure. The technique is delicate and requires precision and accuracy in fine

Fig. 2 (Top)-The Schley Model II in the alternative frontal position, for the right hand user. The forceps pressure grip is positioned 90° to the right.

Fig. 3 (Below)-The Schley Model II in the alternative frontal position, for the left hand user. The forceps pressure grip is positioned 90° to the left.

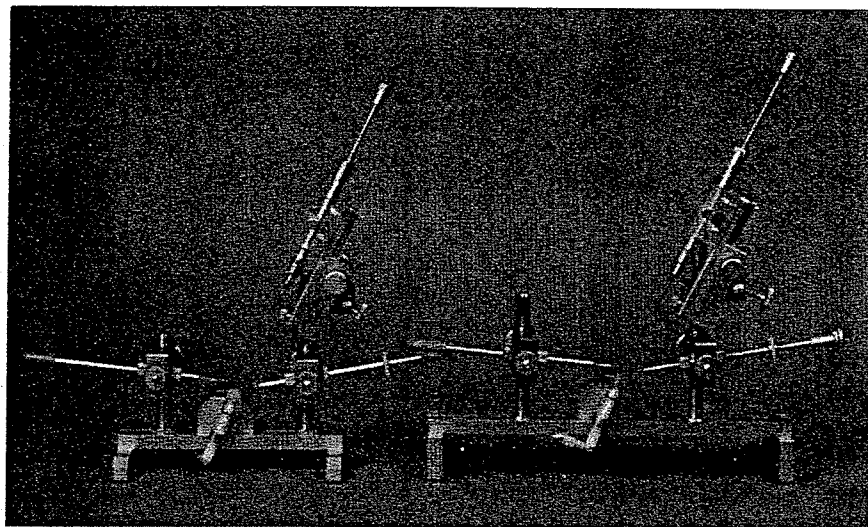
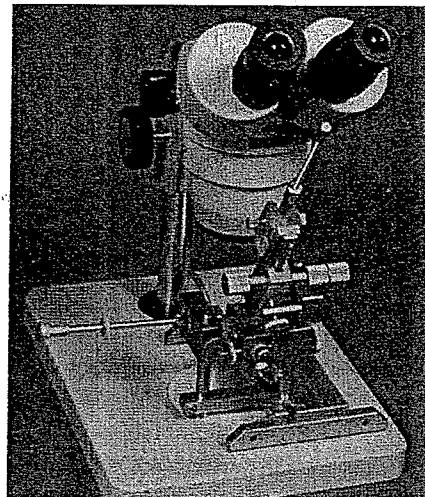
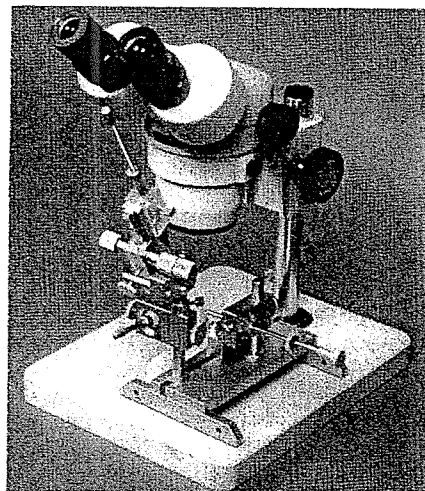


Fig. 1-A comparison of the standard Schley instrument (right) and the new compact Model II.

movements. High repeatability and a wide range of movement are also important features.

Innovations in equipment design have improved the technique. The Schley instrument, modelled after the original Ruttner device, is unique in its evolution of innovations and improvements. In 25 years of insemination equipment design, Prof. Peter Schley has and continues to make changes and modifications. These improvements in instrumentation simulate the natural mating process and provide increased ease of use.

The Schley models are known for their perfection in machining, offering precision control of very fine movements. Micromanipulators provide ease of handling and high repeatability of the procedure. The wide range of movement and flexibility in adjustments stand out as unique and valued features. Schley's most recent new model offers impressive versatility and creative new options.

The New Compact SCHLEY Model II Insemination Instrument

The new, Schley Model II instrument is extremely versatile, designed for both the right (Fig. 2) and left hand user (Fig. 3). The new options in positioning, based upon observations of natural mating, are a major innovation. The individual, varied and changing preferences of users, from the beginner to the experienced, are now well accommodated in one instrument.

Another advantage of the Model II is its compact size. Flatter, narrower and shorter, compared to the standard model, it can be used with a wide range of microscopes types. This also makes it convenient for travel.

The Choice Of Hooks, Forceps and New Positioning

The design of new hooks and techniques to open the queen in a more natural manner has made the insemination procedure easier. For proper insemination, the syringe tip must pass the valve fold and deliver semen directly into the oviduct.

The standard flared, spoon shaped sting hook has largely been replaced. The use of the perforated sting hook, in which the

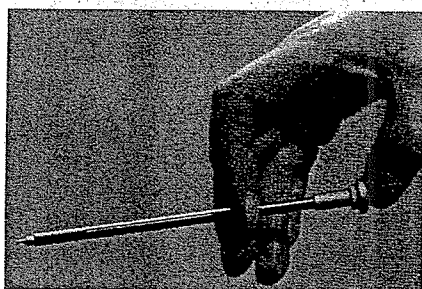


Fig. 4-The Pressure grip forceps, an alternative option to the standard sting hooks. The tiny forceps are designed to lift the sting with push button control.

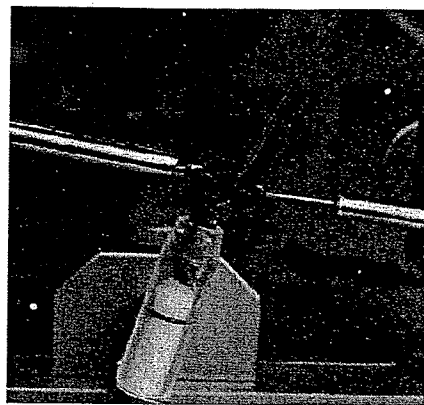


Fig. 5-To more closely simulate natural mating, the queen holding tube is positioned 180° from the standard previously used. The hooks are reversed, the pressure grip forceps are on the left.

sting is threaded, or a pair of hand-held forceps are popular. These are designed to lift sting structure, exposing the orifice, similar to natural mating, to more easily bypass the valve fold.

Another innovation designed by Schley is the pressure grip forceps, pictured in Fig. 4 and Fig. 5. This is a specially sized pair of forceps used to lift the sting structure. For ease of use it is mounted to fit the standard hook holder manipulator and has fingertip, push button control.

The use of a pair of hand held forceps requires manipulation of the sting by the left hand behind the instrument, which can be initially awkward for the right hand user. The mounted pressure grip forceps eliminates this and can be used on either side of the Schley Model II instrument for the right or left handed user.

The versatility of this new instrument design enables use in the standard orientation or this can be turned 90° to place the

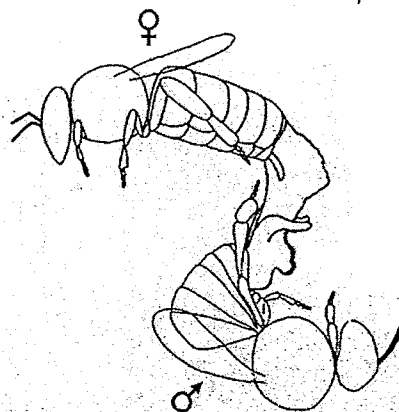


Fig. 6-The new alternatives in positioning for instrumental insemination are based upon observations of natural mating. The drone grasps the queen in flight and falls backwards after ejaculation. Drawing by G. Koeniger.

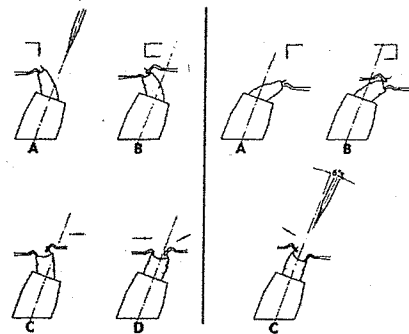


Fig. 7-A comparison of queen and hook positioning. Pictured left in A-D, the queen's sting and sting hook or forceps are placed to the right side. The alternative positioning based on natural mating, is pictured to the right in A-C, the queen's sting and sting hook or forceps are positioned to the left.

syringe in a new frontal position. The frontal position provides an advantage in placing the view of the inseminator in harmony with the direction of the queen holder and syringe. In this position, the sting hook/forceps manipulator can be placed on either side of the instrument for the right or left hand user, as in Fig. 2 and 3.

In addition to the choice of hooks or forceps, the inseminator can use 3 hook manipulators with this instrument. Two ventral hooks and the pressure grip forceps can be used together. For the beginner, just learning the technique, this can be an advantage as all free hand movements are eliminated.

On the other extreme, free hand work is also possible with a pair of forceps. For this technique, the holding blocks can simply be removed. The versatility of this instrument allows the inseminator to explore a variety of techniques, and the beginner to progress into an experienced operator.

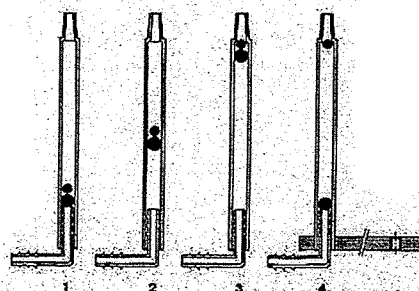


Fig. 8-The new CO₂ Flow Rate Adapter ensures the correct flow of CO₂ to anesthetize the queen during the insemination procedure, preventing overdosing and irregular flow. The proper flow is indicated when the two balls are at opposite ends, as in diagram 4.

New Orientation To Simulate Natural Mating

The queen is positioned on her back during the standard instrumental insemination procedure. Observation of natural mating reveal that she actually mates in the opposite orientation, as the drone grasps her in flight and falls backwards after eversion of the endophallus, as illustrated in Fig. 6.

These observations have led to question if rotation of the queen 180° from the standard would improve the insemination technique. The Model II instrument also accommodates this new orientation. The queen holding tube is rotated 180° and the hooks reversed, as in Fig. 5. A comparison of the two positions is diagramed in Fig. 7.

The basic functionality of the components of the Schley instrument have not changed. The new Model II instrument can be handled in the same manner as the standard instrument, and offers the choice of the additional new options described here. The proven standard model, with the larger and heavier base, is still available.

The New CO2 Flow Rate Adapter

CO2 is used to anesthetize the queen during the insemination procedure. Schley designed a CO2 Flow Rate Adapter, diagramed in Fig. 8, to prevent overdosing and irregular flow.

This device acts as a pressure valve to regulate the flow rate delivered to the

queen. It eliminates the need to speculate gas in a water filled flask or to use a flow meter to determine the flow rate.

Conclusion

The experience of teaching the technique of instrumental insemination, working with numerous students with different needs and preferences has greatly contributed to the development and continued innovations of the Schley instruments. Each improvement made has led to additional changes in the on-going process to perfect the procedure and equipment.

Research findings that reveal new details about the natural mating process have been incorporated into the instrumentation. Consequently, today the technique is easier to learn and perform with consistency. Precision machining combined with the features and options mentioned provide an effective and efficient tool for controlled mating. The new Schley Model II instrument stands out in providing versatility in techniques, adjustments and positioning.

The beginner can try various techniques, find their personal preferences and gain efficiency and accuracy with the options this instrument provides. It is an essential skill for the serious bee breeder. Today, the procedure is easier to learn and use with these improvements and innovations.

For more information on equipment

details, availability and insemination training, contact the authors.

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