प्रौद्योगिकी सूची

TECHNOLOGY Inventory

भा.कृ.अनु.प.–राष्ट्रीय शूकर अनुसंधान केंद्र

ICAR-NATIONAL RESEARCH CENTRE ON PIG

RANI, GUWAHATI-781131, ASSAM

An ISO 9001:2015 Certified Institute

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Technology Inventory 2023

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Preface

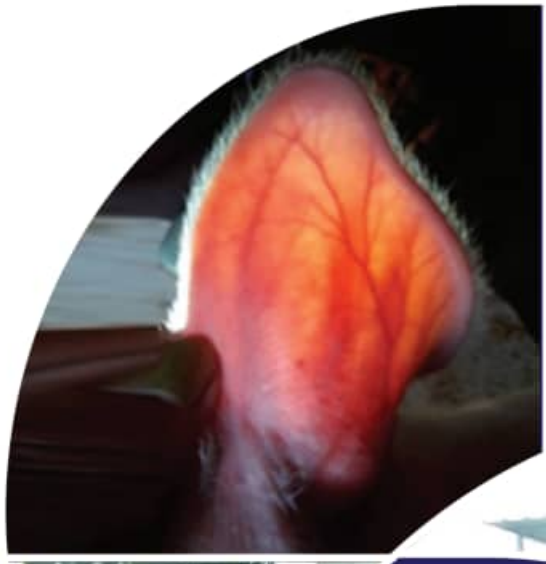
It gives me immense pleasure to present the Technology Inventory published by the ICAR-National Research Centre on Pig, Guwahati, meticulously prepared by our Institute Technology Management Unit (ITMU). This comprehensive compilation represents the culmination of our relentless efforts in research, innovation, and technology transfer in the field of pig husbandry. This inventory showcases our commitment to harnessing scientific advancements for the benefit of the farming community and the swine industry at large. From advancements in genetics and breeding to innovations in nutrition, healthcare, and waste management, each technology featured herein embodies our dedication to addressing the evolving needs and challenges faced by pig farmers.

Moreover, this inventory underscores our firm belief in the importance of commercialization as a means to translate research outcomes into tangible benefits for stakeholders. By making these technologies readily available for commercialization, we aim to catalyze the adoption of modern practices, empower farmers, and contribute to the socioeconomic development of the swine industry.

I extend my heartfelt gratitude to the team at ITMU for their tireless efforts in compiling this inventory and facilitating the transfer of technology from the laboratory to the field. I also express my sincere appreciation to the scientists, technicians, and staff whose unwavering commitment and expertise have been instrumental in developing these innovative solutions.

It is my fervent hope that this Technology Inventory will serve as a valuable resource for entrepreneurs, investors, policymakers, and stakeholders interested in leveraging the latest advancements in pig farming. Together, let us embark on a journey of innovation, collaboration, and transformation to unlock the full potential of the swine industry and contribute to the prosperity of our nation.

(Vivek Kumar Gupta)
Director
ICAR-National Research Centre on Pig,
Guwahati




Piggyprobe qPCR PRRS assay kit
nrcp


Piggyplex
Assay Kit
nrcp
Piggyplex
Assay Kit
nrcp

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About ICAR-NRC on Pig

The ICAR-National Research Centre on Pig, located in Guwahati, India, stands as a pioneering institution dedicated to the advancement of swine research and development in the country. Established under the aegis of the Indian Council of Agricultural Research (ICAR), this center embodies a commitment to fostering excellence in pig farming, genetics, nutrition, and disease management. With a strategic location in the northeastern region of India, renowned for its rich biodiversity and conducive climate for pig rearing, the center plays a pivotal role in addressing the unique challenges and opportunities associated with pig production in this region. Through cutting-edge research, technology dissemination, and capacity building initiatives, ICAR-National Research Centre on Pig endeavors to empower farmers, enhance productivity, and contribute to the sustainable growth of the swine industry, not only in the northeast but across the nation. This introduction serves as a testament to the center's significance as a premier institution driving innovation and progress in the field of pig husbandry in India.

Vision

To bring in excellence in research on pig production, health and product processing to provide technology backstopping for enhanced pork production, employment generation and poverty eduction among socially and economically weaker sections through the medium of pig husbandry.

Mission

Performance appraisal and genetic cataloguing of indigenous pigs, development of improved pig variety together with production, health, product processing and pig based integrated farming system technologies to facilitate the pig rearers of the country achieving household food, nutritional and economic security.

Mandate

- To undertake basic and applied research for enhancing pig production
- To act as repository of information on pig production
- Capacity building

Technology No. 1

NRCP - Nucleic Acid Based Diagnosis of Porcine Reproductive and Respiratory Syndrome (PRRS) Virus Infection in Pigs

Brief description :

Problem Description : Porcine Reproductive and Respiratory Syndrome is a newly emerged exotic disease of pigs in our country. The disease causes huge economic loss to the piggery sector and affects the socio-economic condition of the farmers, mainly in the north-eastern region of India. The diagnostics available for the disease are in very initial stages and we do not have any diagnostic techniques for this particular disease. Presently, no fully validated PCR has international acceptability. No specific and sensitive diagnostics (both for antigen and antibody) are available for PRRSV in India. Currently, we are importing the ELISA kits for the diagnosis of the PRRS infection in pigs. These kits are very costly and have a limited number of applications. Since the disease is very new to us, so currently we do not have any diagnostics or vaccine against the disease. There is no indigenous field isolate of PRRSV and almost nothing is known about how viral proteins relate to virulence and progress of disease in piggery. Therefore, there is an urgent need to develop some techniques for the detection of PPRS virus infection in pigs.

Solution Description : The NRCP-Nucleic acid-based diagnosis of porcine reproductive and respiratory syndrome (PRRS) virus infection in pigs is useful for routine screening of PRRS infection in pigs. The test

Inventors :
Ajay Kumar Yadav, Swaraj Rajkhowa, Seema Rani Pegu, Rajib Deb, Souvik Paul, Juwar Doley, Pranab Jyoti Das and Vivek Kumar Gupta

developed here can simultaneously detect three antigenic (N, M and ORF5) genes of the PRRS virus in a single PCR reaction. Thus the test is extremely specific for PRRS infection in pigs. Further, the test is earmarked for its rapidity (can be completed within 5-6 hours), user-friendliness (as it is easy to perform), cost effectiveness (because it does not need expensive equipment and reagents) and high specificity.

Technology No. 2

Technology for Creating Wealth from Waste (Formulation of Vegetable Waste/ Banana Waste-Based Pig Feed)

Brief description :

Problem Description : In pig farming, feed cost represents more than 75 % of total cost of production. Moreover, there is huge deficit of pig feeds in NE region. So, to reduce the cost of pig feeding, locally available materials like vegetable waste etc can be used to formulate pig feed, which otherwise gets wasted and causes environmental pollution.

Solution Description: The production of low-cost silage from vegetable waste includes the following steps.Collection of vegetable waste/banana stems from the market/field and washing the waste followed by sun drying for 3-4 hours is done before cutting into small pieces. The materials are then mixed with molasses or jaggery @ 3-4 % and salt 0.25 %. After proper mixing, contents are packed in a silage bag or thick polythene in airtight condition. Keep for 21 days. After opening the silage bag, the materials should be finished within 2-3 days. Each pig may be fed with 3 kg vegetable waste silage with 0.5-1.0 kg rice polish/rice bran plus 100 g oil cakes/fish meal along with 2 teaspoonful mineral mixture per day, which will meet the production requirement of the pig. Advantages include reduced feeding costs, improved production performance, and increased profit.

Inventors :
Keshab Barman, Seema Rani Pegu, Rajendran Thomas, Sunil Kumar, Pranab Jyoti Das and Vivek Kumar Gupta

Fig. Cutting of vegetable waste

Fig. Mixing of vegetable waste with jaggery and salt

Fig. Packing in silage bag

Fig. Pressing the materials in silage bag to remove excess air

Fig. Closing of silage bags

Fig. Final silage after 21 days

Technology No. 3

Technology for Creating Wealth from Waste (Vermicompost Production from Pig Dung)

Brief description :

Problem Description : The solid waste of pigs mainly pig dung can be converted to valuable fertilizer *i.e.* vermicompost, which otherwise go waste and causes environmental pollution through foul odour emission. This pollution can be reduced by converting the waste to vermicompost. It can be used in kitchen gardens, flower gardens and other horticultural gardens for the production of organic agricultural products. From 100 adult pigs, one can get 20-25 tonnes of pig dung annually which causes pollution.

Solution Description : For vermicompost from pig manure, it requires mixing of pig dung with cow dung at the ratio of 60:40. First both the dung need to be partially air dried for 1-2 days followed by mixing at that ratio. A rectangular concrete upright silo needs to be prepared. The height of the silo should be 1-1.5 feet so that person can easily enter into it whenever requires. The floor should also be concrete. On the bottom of the silo, 1-2 inches thick dry leaves preferably banana leaves should be spread after cutting into small pieces. The properly mixed materials of pig dung and cow dung should be spread over the dry leaves (half a foot). Then from the corner or side of the wall, earthworms need to be added to the mixed materials followed by covering the same with a wet gunny bag so that it will give a wet dark environment to the earthworms for their multiplication. One can add 50 to 100 numbers of adult earthworms.

Inventors :
Keshab Barman, Seema Rani Pegu, Sunil Kumar, Pranab Jyoti Das and Vivek Kumar Gupta

After 30-40 days, again another mixed layer of cow dung and pig dung can be added. Regularly water needs to be sprinkled to keep the gunny bags wet. When completely digested, the compost should be collected carefully without must damage to the earthworms. One can apply light to separate earthworms from the compositing materials as the earthworms go deep into compost after the application of light.

Fig. Vermicompost Plant

Fig. *Eisenia foetida*

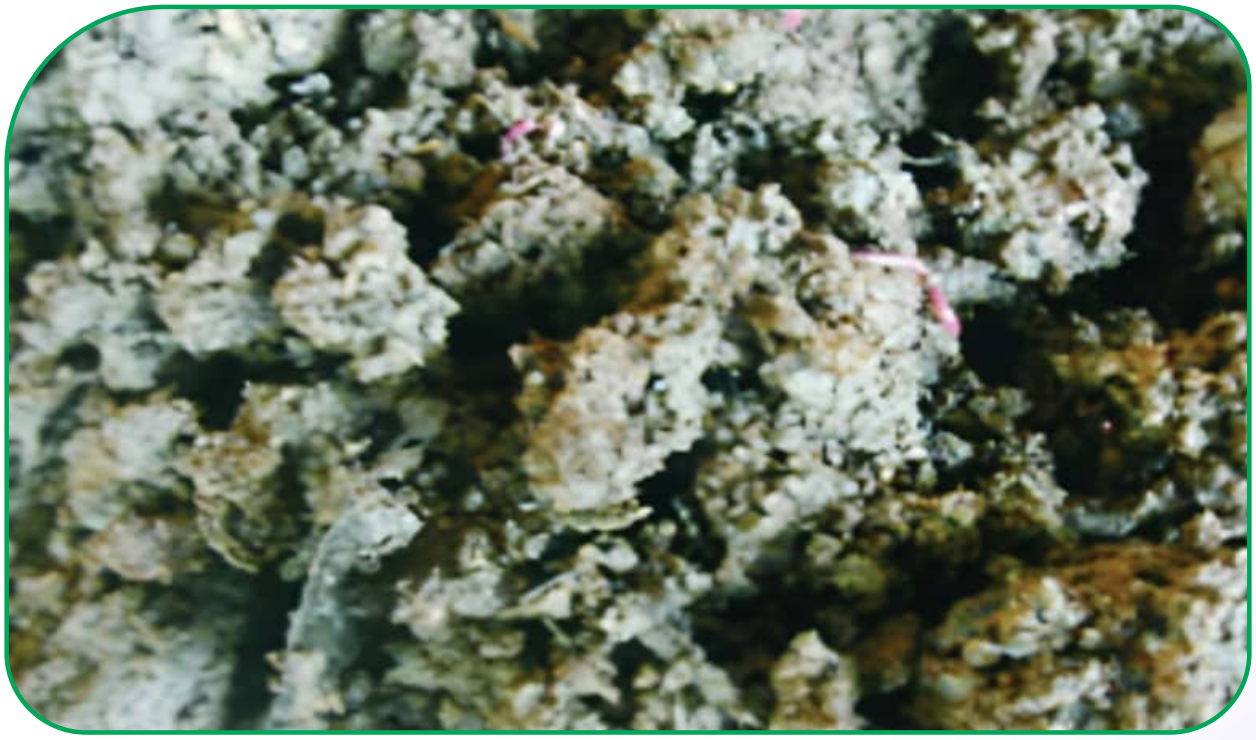


Fig. Vermicompost using pig dung

Fig. Cocoons of *Eisenia foetida*

Technology No. 4

Technology for Economic Feed Formulations for Pigs using Locally Available Feed Ingredients

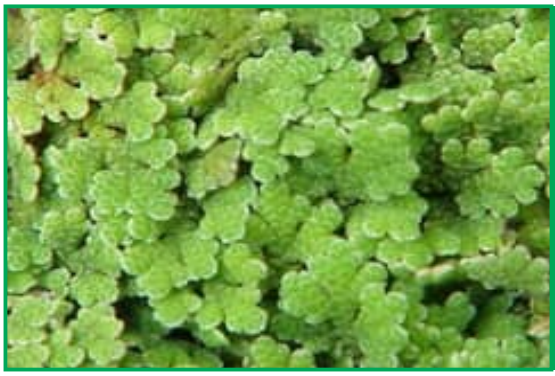
Brief description :

Problem Description : Feed costs represent 65%-75% of the variable costs of swine production. As a result, feed costs play a major role in determining the profitability of a piggery farm. Maize and soybean meal are the main sources of energy and protein, respectively, in swine ration.

Solution Description : Alternative feeds can be used to provide a portion of the energy or protein in the swine ration. Many suitable alternative feed resources meet nutritional requirements while reducing the cost of the ration. Brewer's rice by-products, bakery waste, azola, moringa leaves, silkworm pupa meal, tapioca tubers, colocasia, steamed flake rice products, bakery waste, water hyacinth etc are such alternative pig feeds available in large quantities in Assam and other NE states. This by-product can be used to replace either energy or protein feed ingredients at various percentages to formulate economic rations for pigs without affecting nutrient utilization. Feeding costs are greatly reduced by employing such technologies.

Inventors :
Keshab Barman, Seema Rani Pegu, Sunil Kumar, Pranab Jyoti Das and Vivek Kumar Gupta

Few Photos of local feed resources



Azolla

Colocasia

Bakery waste

Water hyacinth

Few Photos of local feed resources

Banana Plant

Morninga Leaves

Rubber Seed

Silk worm pupa

Technology No. 5

Technology for the Development of Chelated Trace Mineral Mixture to Improve Pig Production

Brief description :

Problem Description : Inadequate intake of trace minerals may result in reduced intake, lower reproductive efficiency, poor immunity, slower daily gains, and poorer feed conversion. The trace mineral salts are broken down in the digestive tract to form free ions and are then absorbed. However, free ions are very reactive and can form complexes with other dietary molecules, which are difficult to absorb. Thus, the availability of trace minerals to the animals therefore varies considerably, and under extreme conditions it may be unavailable for absorption. Large quantities of undigested minerals are then excreted and cause environmental pollution. For this reason, there is growing interest in organic trace mineral supplements i.e., proteinated or chelated trace minerals.

Solution Description : Indigenous production of trace mineral products namely Zn-Met, Cu-Met, Co-Met and Fe-Met has been developed. The inorganic mineral salt has been dissolved in water followed by precipitating in alkaline conditions. Precipitate is dissolved in low concentration HCL followed by mixing with a standard concentration of hot methionine–water solution. The mixture is then precipitated with standard NaOH solution and the precipitate is dried at 50-55^{0}C and then becomes ready to use as organic trace minerals. A mineral mixture for pigs namely 'PIGMIN' has been developed at the institute which improved the production performances of pigs.

Inventor : Keshab Barman

Technology No. 6

Technology for Tapioca Tubers-Based Pig Feed

Brief description :

Problem Description : In pig farming, feed cost represents more than 75 % of the total cost of production. Moreover, there is a huge deficit of pig feeds in the NE region. So, to reduce the cost of pig feeding locally available materials like tapioca tubers can be used to formulate pig feed, which is very perishable and gets fungal contamination within 2-3 days in an open environment after harvesting.

Solution Description: The technology involves silage-making from tapioca tubers. The steps are mentioned below.

1. Harvesting of tapioca tubers
2. Peeling of tubers
3. Cutting into small pieces
4. Mixing the materials with molasses or jaggery @ 3-4 % and salt 0.25 %
5. Keep in sunlight or open air for 2-3 hours for partial drying.
6. Mixed properly and packed in a silage bag or thick polythene in airtight condition
7. Keep for 30 days (normal silage requires 21 days tapioca requires 30 days to detoxify the hydrocyanic acid present in tapioca tubers)
8. Then materials become ready for feeding
9. After opening the silage bag, the materials should be finished within 2-3 days. 3 kg tuber silage with 0.5-1.0 kg rice polish/rice bran plus 100 g oil cakes/fish meal along with 2 teaspoonful mineral mixture per day per adult pig will meet the production requirement of the pig.

Inventors :
Keshab Barman, Seema Rani Pegu, Sunil Kumar, Pranab Jyoti Das and Vivek Kumar Gupta

Technology No. 7

High Producing Crossbred Pig for Breeder Farmer

Brief description :

Problem Description : The sustainability of pig farms depends upon the availability of improved germplasm in multiplier farms which can consistently supply its replacement stock. Looking to the high potentiality of the piggery sector for multipliers on one hand and the lack of a sufficient number of high-performing improved pig germplasm on the other hand, a breeding programme was initiated at the ICAR-National Research Center on Pig, Guwahati by using Ghoongroo as indigenous germplasm and Hampshire as exotic germplasm to develop a suitable crossbred pig for multipliers of the northeastern and neighbouring region and the institute has successfully developed the crossbred pig variety named as Rani, based on the locality name.

Solution Description : To achieve the objective, a planned crossbreeding program with rigorous selection resulted in the development of Rani, a crossbred pig variety with the following features :

- Higher litter size at birth and weaning
- Higher litter weight at birth and weaning
- Promising growth rate
- Better adaptability

The body condition of the sow remains excellent up to fifth farrowing

Inventors :
Santanu Banik, Soumen Naskar, Pranab Jyoti Das, Satish Kumar, Keshab Barman Rajendran Thomas, Sunil Kumar, Swaraj Rajkhowa and Vivek Kumar Gupta

Technology No. 8

A Crossbred Pig for Fattening Farmer

Brief description :

Problem Description : In the recent past, the country has experienced increased involvement of farmers and entrepreneurs in the piggery sector, which will not only mitigate the demand-supply gap in the sector but also increase the employment generation potential among the rural youths. Involvement of finisher produces in the piggery sector requires the availability of improved germplasm with maximum growth rate and thus ensures better economic return.

Solution Description : Duroc sires are utilized most frequently as Terminal/Paternal sires in a terminal cross-breeding program. To achieve the objective of developing of high-producing crossbred pig, a breeding programme was initiated at the ICAR-National Research Center on Pig, Guwahati to use Duroc as a terminal sire for crossing with Rani sows, a crossbred of Hampshire and Ghoongroo. The planned crossbreeding program with rigorous selection resulted in the development of Asha, a crossbred pig with 25% Ghoongroo, 25% Hampshire, and 50% Duroc inheritance. The developed variety has a promising growth rate and is adaptable to local climatic conditions.

Inventors :
Santanu Banik, Soumen Naskar, Pranab Jyoti Das, Satish Kumar, Keshab Barman Rajendran Thomas, Sunil Kumar, Swaraj Rajkhowa and Vivek Kumar Gupta

Technology No. 9

Individual Identification of Pig by Auricular Venation Pattern

Brief description :

Problem Description : Individual animal identification not only allows producers to keep records of animal's parentage, birth, production records, and health history but is also useful for precision farming systems and the implementation of different Governmental plans and policies for animal farming. Traditional methods of animal identification viz. ear notching, tattooing, branding, tagging, and use of RFID do not provide secure animal identification due to possibilities of theft, falsification, duplication, and certain animal ethics issues including invasive procedures.

Solution Description : After experimentation with different traits like ear contour, ear venation, iris, and muzzle imprint, auricular venation pattern was finalized for individual identification of pigs. For this purpose pictures from different pigs of five breeds namely Large White Yorkshire (LWY), Ghoongroo, Hampshire, Duroc, and Mali were captured based on pre-assigned rules of photography. Consistency of venation patterns was tested on 21 LWY at six stages of growth (60, 70, 85, 100, 110, and 120 days).

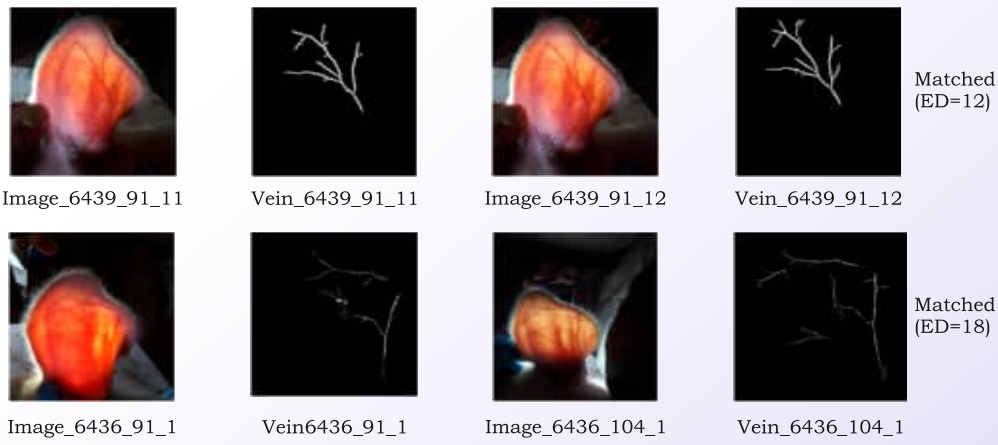


Fig. Matching of different images of the same pig in different age (91 days and 104 days)

Inventors :
Santanu Banik and *Satyendra Nath Mandal

**** Govt.Engg.College, Kalyani, WB***

Technology No. 10

Individual Identification of Goat by Iris Image

Brief description :

Problem Description : Individual animal identification not only allows producers to keep records of animal's parentage, birth, production records, and health history but is also useful for precision farming systems and the implementation of different Governmental plans and policies for animal farming. Traditional methods of animal identification viz. ear notching, tattooing, branding, tagging, and use of RFID do not provide secure animal identification due to possibilities of theft, falsification, duplication, and certain animal ethics issues including invasive procedures.

Solution Description : The suitability of the Iris for individual identification was confirmed through more than 5000 images from individuals of diverse breeds, Black Bengal, Barbari, Jamunapari, Jakhrana, Sirohi, and Beetal. The captured image has been pre-processed for segmentation with the help of a contour tracing algorithm and filters. The segmented iris was normalized and templates were generated and stored along with the identification of the goat in the database for animal recognition in the future. For verification, the template of the recaptured image from the same goat was tested for matching with the stored database. Up to 80 percent matching was achieved for the repeated image of the same individual.

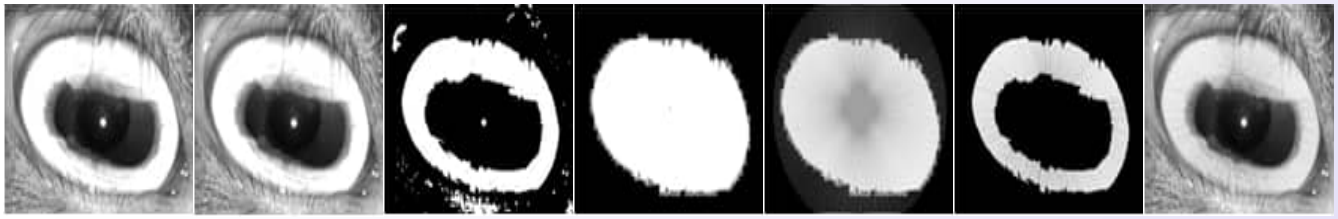


Fig. Step-wise feature extraction of goat iris image

Inventors :
Santanu Banik and *Satyendra Nath Mandal

**** Govt.Engg.College, Kalyani, WB***

Technology No. 11

Pig/Goat Breeds Identification by Whole Body Contour Segmentation

Brief description :

Problem Description : Breed identification based on random images is a challenge. Information technology/ artificial intelligence was used for the identification of breeds.

Solution Description : The technology for breed identification of pigs is based on individual images of Duroc, Ghoongroo, Hampshire, Mali, Niang-Megha, Yorkshire, and Doom. The study in goats was based on six goat breeds namely Black Bengal, Jakhrana, Jamunapari, Sirohi, Beetal, and Barbari. The images were processed through two methods:

I. HUE Measurement in the control environment showed the ranges of HUE value of each pig breed are unique and used for identification of breed. The seven pig breeds were successfully identified. Most of the goat breeds showed unique HUE values. However, in some cases the HUE values of morphometrically similar goat breeds (viz. Black Bengal, Jakrana, and Beetal) overlap. For these breeds, a part-wise comparison of goats was done for the identification of the breed.

II. The TensorFlow framework was created by Google for creating Deep Learning models by using multi-layer neural networks. 90% of the available data set of both pigs and goats was used for training and the rest 10% was used for testing. The approach has successfully identified pig breeds as well as goat breeds where images have been captured in a controlled environment, an uncontrolled environment, and a combination of both environments.

Inventors :
Santanu Banik and *Satyendra Nath Mandal

**** Govt.Engg.College, Kalyani, WB***

Fig. TensorFlow ™ showed 99% matching result for breed identification of pigs

Fig. TensorFlow ™ showed 99% matching result for breed identification of Goats

Technology No. 12

A Portable Free Standing Small-Animal Restraining Tool

Brief description :

Problem Description : Restraining tools are essential for the easy handling of all animals during the conduction of different veterinary procedures. Such procedures include external examination of organs of the animal, ocular examination, small operations, administration of injections, collection of samples viz. blood, hair, etc., ear tagging, and application of other identification devices on the animal. They are also necessary for artificial insemination (AI), stunning or generally gaining absolute control of the animal at any time

Solution Description : A tool was developed to restore the small animals. The present invention relates in general to restraining tools and harnesses for animals and in particular to a portable small-animal restraining tool that is free-standing, cost-effective, and easy to handle. The tool is intended for handling small animals like sheep, goats, dogs, etc.

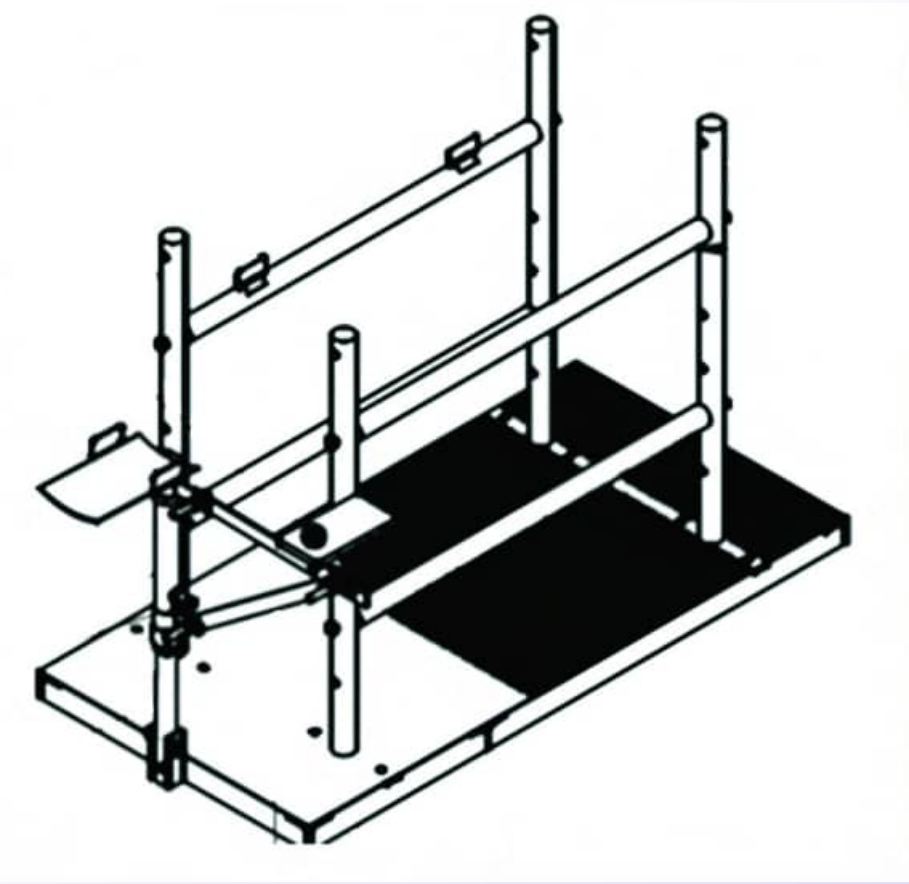


Fig. Portable Free Standing Small-Animal Restraining Tool

Inventors :
Santanu Banik and *Satyendra Nath Mandal

**** Govt.Engg.College, Kalyani, WB***

INTELLECTUAL PROPERTY INDIA

क्रम सं/SL No :033129796

सत्यमेव जयते

पेटेंट कार्यालय,भारत सरकार | The Patent Office, Government Of India

पेटेंट प्रमाण पत्र | Patent Certificate

(पेटेंट नियमावली का नियम 74) (Rule 74 of The Patents Rules)

पेटेंट सं. / Patent No. : 478346

आवेदन सं. / Application No. : 201831033038

फाइल करने की तारीख / Date of Filing : 03/09/2018

पेटेंटी / Patentee : 1.ICAR-NATIONAL RESEARCH CENTRE ON PIG 2.Indian Institute under Kalyani University

प्रमाणित किया जाता है कि पेटेंटी को, उपरोक्त आवेदन में यथाप्रकटित *A PORTABLE FREE STANDING SMALL-ANIMAL RESTRAINING TOOL* नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबंधों के अनुसार आज तारीख सितम्बर 2018 के तीसरे दिन से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled *A PORTABLE FREE STANDING SMALL-ANIMAL RESTRAINING TOOL* as disclosed in the above mentioned application for the term of 20 years from the 3rd day of September 2018 in accordance with the provisions of the Patents Act,1970.

अनुदान की तारीख : 07/12/2023
Date of Grant :

पेटेंट नियंत्रक
Controller of Patents

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि इसे बनाए रखा जाना है, सितम्बर 2020 के तीसरे दिन को और उसके पश्चात प्रत्येक वर्ष में उसी दिन देय होगी।

Note. - The fees for renewal of this patent, if it is to be maintained, will fall / has fallen due on 3rd day of September 2020 and on the same day in every year thereafter.

Technology No. 13

Pig Restraining Tool

Brief description :

Problem Description : Restraining tools are essential for the easy handling of all animals during the conduction of different veterinary procedures. Such procedures include external examination of organs of the animal, ocular examination, small operations, administration of injections, collection of samples viz. blood, hair, etc., ear tagging, and application of other identification devices on the animal. They are also necessary for artificial insemination (AI), stunning or generally gaining absolute control of the animal at any time

Solution Description : A tool was developed to restore pigs. The present invention relates in general to restraining tools and harnesses for animals and in particular to a portable small-animal restraining tool that is free-standing, cost-effective and easy to handle. The tool is intended for handling pigs.

Fig. Pig Restraining Tool

Inventors :
Santanu Banik and *Satyendra Nath Mandal

**** Govt.Engg.College, Kalyani, WB***

INTELLECTUAL PROPERTY INDIA

सत्यमेव जयते

क्रम सं/SL No :033132632

पेटेंट कार्यालय,भारत सरकार
The Patent Office, Government Of India

पेटेंट प्रमाण पत्र | Patent Certificate

(पेटेंट नियमावली का नियम 74) (Rule 74 of The Patents Rules)

पेटेंट सं. / Patent No.	:	505749
आवेदन सं. / Application No.	:	201831043234
फाइल करने की तारीख / Date of Filing	:	16/11/2018
पेटेंटी / Patentee	:	1.ICAR-NATIONAL RESEARCH CENTRE ON PIG Under Indian Council of Agricultural Research an Indian registered body under the Registration of Society Act (Act XXI of 1860) 2.KALYANI GOVERNMENT ENGINEERING COLLEGE An Indian Institute under Maulana Abul Kalam Azad University of Technology

प्रमाणित किया जाता है कि पेटेंटी को, उपरोक्त आवेदन में यथाप्रकटित *PIG RESTRAINING TOOL* नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबंधों के अनुसार आज तारीख नवम्बर 2018 के सोलहवें दिन से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled *PIG RESTRAINING TOOL* as disclosed in the above mentioned application for the term of 20 years from the 16th day of November 2018 in accordance with the provisions of the Patents Act,1970.

अनुदान की तारीख : 31/01/2024
Date of Grant :

पेटेंट नियंत्रक
Controller of Patents

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि इसे बनाए रखा जाना है, नवम्बर 2020 के सोलहवें दिन को और उसके पश्चात प्रत्येक वर्ष में उसी दिन देय होगी।

Note. - The fees for renewal of this patent, if it is to be maintained, will fall / has fallen due on 16th day of November 2020 and on the same day in every year thereafter.

Technology No. 14

Pig Breeding Technologies Including Farm Data Collection

Brief description :

Problem description : With the increasing demand for pork and pork products, pig farmers face challenges for the need to improve efficiency and productivity. To meet these demands, advanced pig breeding technologies and data recording practices have become essential. The scientific pig breeding technology and accurate farm data collection can improve the productivity, and efficiency of the pig farm and ultimately result in increasing the farmers income to double than conventional method.

Solution description : The technology facilitates data collection and recording with ease. It aids in selection of the breedable pigs especially boars and sows along with the measures to reduce inbreeding in pigs. It will greatly enhance the profitability from pigs and for that purpose the appropriate recording of data from farm is very crucial. Pig breeding technologies, coupled with farm data collection, are vital for addressing the challenges faced by modern pig farming. By addressing these issues, pig industry can achieve greater efficiency, sustainability, and productivity, ensuring a stable and secure food supply.

To achieve the target for profitable pig breeding, technologies for the following aspects were standardized for farmers' fields.

- Methods of Selection of Pig
- Boar selection
- Avoiding inbreeding
- Data recording modules

Inventors :
Santanu Banik, Pranab Jyoti Das, Satish Kumar, Meera K. and Vivek Kumar Gupta

Technology No. 15

Multiplex PCR Kit for Rapid Detection of Important Pathotypes of *Escherichia coli* from Diarrhoeic Piglets

Brief description:

Problem Description : Diarrhoea in pigs is a complex problem resulting from infective agents, host community and management procedures. It causes considerable economic losses to the pig producers. Enteric colibacillosis is very common and is the most important cause of enteric disease in pigs.

Diarrhoea in piglets is caused by different pathotypes of *E.coli* such as Enterotoxigenic *E.coli* (ETEC), attaching and effacing *E.coli* and sometimes by Shigatoxin producing *E.coli* (STEC).

Solution Description : A novel multiplex PCR (including genes representing common pathotypes of *E.coli* associated with piglet diarrhoea) for the rapid, specific**,** and simultaneous detection of commonly prevalent pathotypes of *E.coli* from diarrheic piglets**.** The multiplex PCR kit is a ready-to-use kit developed for the detection of prevalent pathotypes of *Escherichia coli* from diarrhoeic piglets based on genes (*est*1, *elt*1, *stx*1 and *eae*A)

The kit enables success in multiplex PCR at the first attempt. There is no need to optimize reaction conditions (e.g., the concentration of primers, Mg^{2+}, and Taq DNA polymerase) and cycling parameters due to pre-optimized reagents included in the kit.

Inventors :
Swaraj Rajkhowa, Seema Rani Pegu and Vivek Kumar Gupta

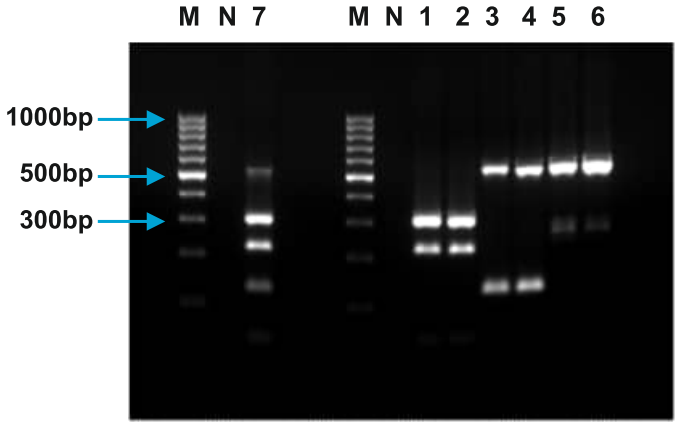
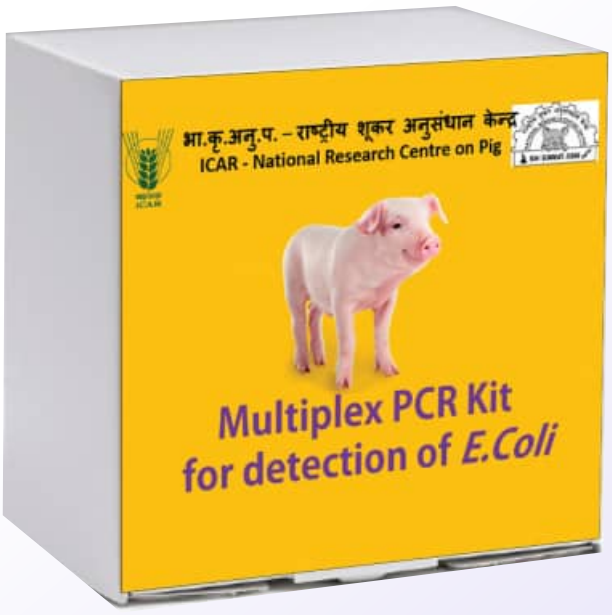


Fig. Agarose gel showing multiplex PCR assays for detection of different pathotypes of *Escherichia coli* from diarrhoeic piglets. Lane M: molecular marker (100bp DNA ladder), N: Negative control, lane 1: Positive control for genes *est*1 and *elt*1, lane 2: Test sample positive for *est1* (222bp) and *elt*1 (308bp) genes, lane 3: Positive control for genes *eae*A and *stx*1, lane 4: Test sample positive for genes *eae*A (535bp) and *stx*1(127bp), lane 5: Positive control for *eae*A gene, lane 6: Test sample positive for *eae*A (535bp) gene, lane 7: Mixture of all positive control strains showing band representing different pathotypes of *E.coli* from diarrhoeic piglets



Technology No. 16

Multiplex PCR Kit for Rapid Detection of Methicillin- Resistant *Staphylococcus Aureus* (MRSA) from Biological Samples

Brief description :

Problem Description : *Staphylococcus aureus* is one of the important pathogens of both humans and animals. Methicillin-resistant *Staphylococcus aureus* (MRSA) has become a pathogen of increasing importance in hospitals (healthcare-associated MRSA), the community (community-associated MRSA) and livestock operations (livestock-associated MRSA). These bacteria can be transmitted to humans in close contact with MRSA-colonized animals. Livestock, especially pigs can serve as reservoirs for LA-MRSA.

A higher prevalence of MRSA is reported to be found in the nasal cavity of pigs. The widespread use of antibiotics has led to the emergence of multidrug-resistant strains, making their eradication more difficult. The use of antimicrobial drugs in food-producing animals is considered to contribute to the emergence of antimicrobial resistance. Although contact with animals seems to be the most important risk factor for humans, meat products may also be a source of bacteria.

Solution Description : This multiplex PCR kit is a ready–to–use kit developed for the detection of Methicillin-resistant Staphylococci based on the following genes: *16s* gene, *Mec* A gene, *Nuc* gene.

The kit enables success in multiplex PCR at the first attempt. There is no need to optimize reaction conditions (e.g., the concentration of primers, Mg^{2+}, and Taq DNA polymerase) and cycling parameters due to pre-optimized reagents included in the kit.

Inventors :
Swaraj Rajkhowa, Seema Rani Pegu, Pranab Jyoti Das and Vivek Kumar Gupta

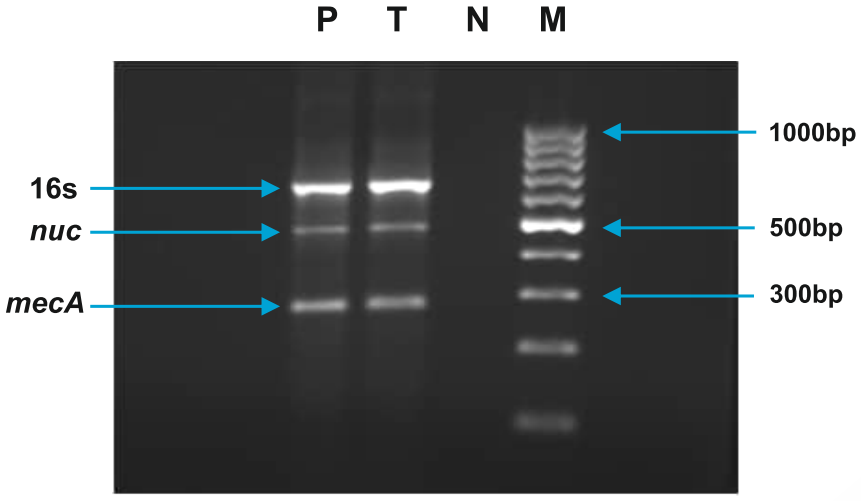


Fig. Triplex-PCR for simultaneous detection of 16S rRNA (654bp), *mecA* (280bp) and *nuc* (481bp) genes of MRSA from pigs. Lane M: Molecular marker (100bp DNA ladder), Lane N: Negative control, Lane P: Positive control and Lane T:

Technology No. 17

Multiplex PCR Kit for Rapid Detection of Virulence Associated Genes of *Pasteurella Multocida* from Pigs

Brief description :

Problem Description : Pasteurellosis is an economically important disease in livestock, according to the World Animal Health Organization (OIE). Pasteurella species, most notably *P.multocida* are often associated with chronic as well as acute infections that lead to significant morbidity and mortality resulting in huge economic losses to the pig producers. In pigs *P.multocida* infection is common and the lung is the most frequent site of infection.

Solution Description : This multiplex PCR kit is a ready–to–use kit developed for the detection of Pasteurella multocida based on the following virulence-associated genes of the organism:

1. *ompA*
2. *ompH*
3. *plpB*
4. *hgbA*
5. *pfhA*

The kit enables success in multiplex PCR at the first attempt. There is no need to optimize reaction conditions (e.g., the concentration of primers, Mg^{2+}, and Taq DNA polymerase) and cycling parameters due to pre-optimized reagents included in the kit.

Inventors :
Swaraj Rajkhowa, Seema Rani Pegu, Pranab Jyoti Das and Vivek Kumar Gupta

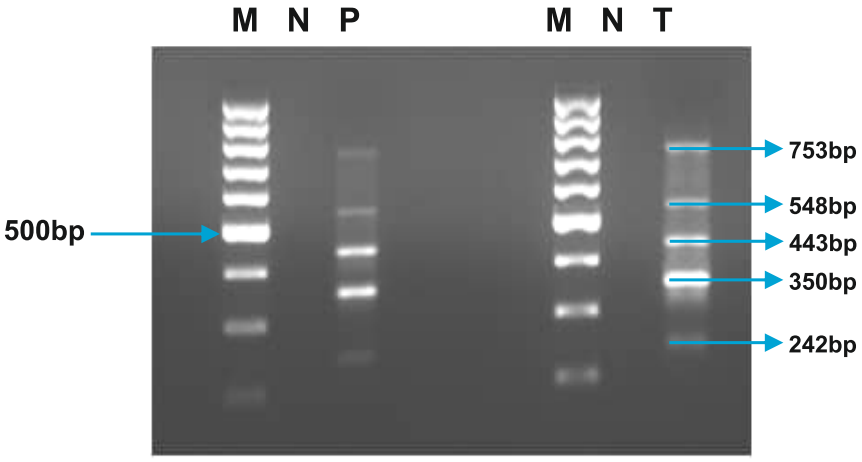


Fig. Detection of virulence associated genes [*ompH* (242bp), *ompA* (350bp), *plpB* (443bp), *hgbA* (548bp) and *pfhA* (753bp)] of *P. multocida* from pigs by multiplex PCR (Multiplex 1) M: Molecular marker (100bp DNA ladder), N: Negative control, lane P: Positive control, lane T: Test organism

Technology No. 18

LAMP (Loop Mediated Isothermal Amplification) Assay Kit for Detection of Porcine Circovirus Type–2 (PCV-2)

Brief description :

Problem Description : Globally, Porcine circovirus type 2 (PCV-2) is a recognized viral pathogen of great economic value in pig farming. It is the major cause of ravaging post-weaning multisystemic wasting syndrome (PMWS) and many other disease syndromes generally regarded as Porcine circovirus-associated diseases (PCVAD). LAMP (Loop-mediated isothermal amplification) assay is highly sensitive and specific and it's a quite rapid detection technique that was therefore developed for the detection of PCV-2 infection which can even be used as a point of care (PoC) diagnostics.

Solution Description : LAMP is a sensitive, easy and time-efficient assay for detection of Porcine Circovirus Type-2 (PCV-2). The LAMP reaction proceeds at a constant temperature using only a water bath or a heat block, making it user-friendly in field conditions.

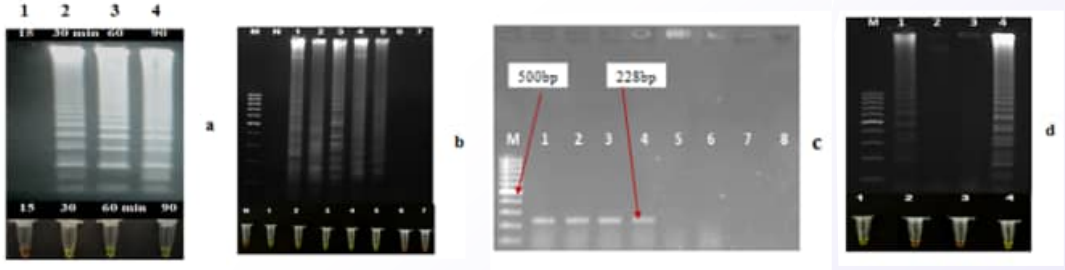


Fig. a : Variation of reaction time in the LAMP assay. Lane 1 to 4: Reactions time of 15, 30, 60 and 90 minutes, respectively; **b: Sensitivity of the LAMP assay.** Lane M : 1 kb Marker (Thermo Scientific), Lane N : Non-template control (NTC), Lane 1 : 50ng of PCV2 DNA, Lane 2 : 5ng of PCV2 DNA, Lane 3 : 500pg of PCV2 DNA, Lane 4 : 50pg of PCV2 DNA, Lane 5 : 5pg of PCV2 DNA, Lane 6 : 500fg of PCV2 DNA, Lane 7 : 50fg of PCV2 DNA; **c: Sensitivity of the conventional PCR.** Lane M: GeneRuler 100bp DNA ladder (Thermo Scientific), Lane 1: 50ng of PCV2 DNA, Lane 2: 5ng of PCV2 DNA, Lane 3: 500pg of PCV2 DNA, Lane 4: 50pg of PCV2 DNA, Lane 5: 5pg of PCV2 DNA, Lane 6: 500fg of PCV2 DNA, Lane 7: 50fg of PCV2 DNA, Lane 8: Non-template control (NTC); **d: Specificity of the LAMP assay.** Lane M : 1 kb Marker (Thermo Scientific), Lane 1 : PCV2 sample, Lane 2 : PPV positive sample, Lane 3 : CSFV positive sample, Lane 4 : PCV2 sample

Inventors :
Swaraj Rajkhowa, Seema Rani Pegu, Manjisa Chowdary, Dilip Kumar Sarma and Vivek Kumar Gupta

ICAR-AS-NRCP-Technoloy-2023-076

भाकृअनुप
ICAR

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Dr. Swaraj Rajkhowa

(Lead Developer)

Associate Developers

Dr. Seema Rani Pegu, Dr. Manjisa Choudhury
Dr. Dilip Kumar Sarma, Dr. Vivek Kumar Gupta

of

ICAR-National Research Centre on Pig
Guwahati, Assam

has developed the technology

LAMP (Loop Mediated Isothermal Amplification) Assay Kit for Detection of Porcine Circovirus Type – 2 (PCV-2): Technology

16th July, 2023
New Delhi

(Amrish K. Tyagi)
Assistant Director General

(J.K. Jena)
Deputy Director General (Animal Science)

Technology No. 19

LAMP (Loop Mediated Isothermal Amplification) Assay Kit for Detection of Porcine Parvovirus (PPV)

Brief description :

Problem Description : Porcine Parvovirus (PPV) is an important cause of embryonic and foetal loss in pigs. Disease caused by PPV is restricted to the pregnant sow or gilt with the virus capable of infecting and destroying both embryos and fetuses. It is the most common cause of the traditionally called stillbirths, mummification, embryonic death, and infertility (SMEDI) syndrome. Presently, no vaccine for PPV is available in India, contributing to one of the major problems of reproductive failure in pigs. LAMP assay being highly sensitive, specific, and quite rapid detection technique was therefore developed for the detection of PPV infection which can even be used as a point of care (PoC) diagnostics.

Solution Description : LAMP is a sensitive, easy, and time-efficient assay for the detection of Porcine Parvovirus (PPV). The LAMP reaction proceeds at a constant temperature using only a water bath or a heat block, making it user-friendly in field conditions.

Advantages :

- Portable (designed for field testing using a heating block or heat bath) and easy to use. Does not require high-tech apparatus and/or complex preparation from highly trained personnel (specific and processed samples)
- Rapid results (within 45-60 minutes)
- Higher diagnostic sensitivity
- Excellent analytical specificity
- Robust (works even in crudely extracted clinical samples)

Inventors :
Swaraj Rajkhowa, Seema Rani Pegu, Manjisa Choudhury and Dilip Kumar Sarma

ICAR-AS-NRCP-Technology-2023-077

भाकृअनुप
ICAR

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Dr. Swaraj Rajkhowa

(Lead Developer)

Associate Developers

Dr. Seema Rani Pegu, Dr. Manjisa Choudhury

Dr. Dilip Kumar Sarma

of

ICAR-National Research Centre on Pig

Guwahati, Assam

has developed the technology

LAMP (Loop Mediated Isothermal Amplification) Assay Kit for Detection of Porcine Parvovirus (PPV): Technology

16th July, 2023

New Delhi

(Amrish K. Tyagi)
Assistant Director General

(J.K. Jena)
Deputy Director General (Animal Science)

Technology No. 20

Multiplex PCR Kit for Simultaneous Detection of Porcine Circovirus-2 (PCV-2), Porcine Parvovirus (PPV) and Classical Swine Fever Virus (CSFV)

Brief description :

Problem Description : Globally, Porcine circovirus type 2 (PCV-2) is a recognized viral pathogen of great economic value in pig farming. It is the major cause of ravaging postweaning multisystemic wasting syndrome (PMWS) and many other disease syndromes generally regarded as Porcine circovirus-associated diseases (PCVAD). Porcine Parvovirus (PPV) is an important cause of embryonic and foetal loss in pigs. Disease caused by PPV is restricted to the pregnant sow or gilt with the virus capable of infecting and destroying both embryos and fetuses. It is the most common cause of the traditionally called Stillbirths Mummification Embryonic Death and Infertility (SMEDI) syndrome. Classical swine fever (CSF) remains one of the most important and endemic viral diseases of swine throughout India and is responsible for huge economic losses to pig producers.

Solution Description : Multiplex PCR consists of multiple primer sets within a single PCR mixture to produce amplicons of varying sizes that are specific to different DNA sequences. By targeting multiple sequences at once, multiple results are produced in a single test run that otherwise would require several times the reagents and more time to perform. This multiplex PCR kit is a ready-to-use kit developed for the simultaneous detection of three viruses :

- Porcine Circovirus type 2 (PCV-2) – DNA virus
- Porcine Parvovirus (PPV) – DNA virus
- Classical Swine Fever Virus (CSFV) – RNA virus

Inventors :
Swaraj Rajkhowa, Seema Rani Pegu Manjisa Choudhury, Dilip Kumar Sarma and Vivek Kumar Gupta

ICAR-AS-NRCP-Technology-2023-078

भाकृअनुप
ICAR

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Dr. Swaraj Rajkhowa

(Lead Developer)

Associate Developers

Dr. Seema Rani Pegu, Dr. Manjisa Choudhury
Dr. Dilip Kumar Sarma, Dr. Vivek Kumar Gupta

of

ICAR-National Research Centre on Pig
Guwahati, Assam

has developed the technology

Multiplex PCR Kit for Simultaneous Detection of Porcine Circovirus -2 (PCV-2), Porcine Parvovirus (PPV) and Classical Swine Fever Virus (CSFV): Technology

16th July, 2023
New Delhi

(Amrish K. Tyagi)
Assistant Director General

(J.K. Jena)
Deputy Director General (Animal Science)

Technology No. 21

Artificial Insemination in Pigs

Brief description:

Problem Description : Natural insemination in pigs has limitations of disease transmission, poor genetic diversity, and inefficiency. Technology innovations are required to facilitate uniform fertilization, and scalability. There is a need of a promising reproductive technology that would enhance reproductive success, improve genetic traits, ensure biosecurity, and boost productivity in commercial pig farming systems.

Solution Description : Artificial Insemination is a technology by which semen is collected from a superior trained boar, and then tested, processed, packed/ stored and inseminated into a receptive female at the right time of heat. AI in pig has the following advantages viz., reduction in keeping the cost of males, genetic improvement, farmers' doorstep service, and control of disease transmission.

Fig. Artificial Insemination in process

Fig. Litter born using A.I. in gilt

Inventors : Sunil Kumar and Rafiqul Islam

Technology No. 22

Technology for Cost-Effective Micro Pig Abattoir

Brief description :

Problem Description : Pigs are often slaughtered in a very inhumane way in most rural parts of the country. This results not only in imparting stress to the animal but also retard the quality and stability of pork.

Solution Description : Technology for the construction of cost-effective pig slaughterhouses in rural areas has been developed. The technology offers provisions for electrical stunning, bleeding, and cleaning operations in a raised platform, treatment of effluents, etc. as per FSSAI requirements.

Fig. Micro pig abattoir

Inventors : Rajendran Thomas and Vivek Kumar Gupta

Technology No. 23

Technology for Hygienic Transport of Meat for Local Distribution

Brief description :

Problem Description : Currently, meat is sold in open markets without any cold chain facilities in most of the country. In most of the cases, meat gets spoiled by the time it reaches the consumers.

Solution Description : A container for hygienic transport of meat for local distribution has been designed and developed. The container can be fitted onto the carrier of a bicycle or a bike as applicable. A patent has been granted for this technology (Patent no. 296345).

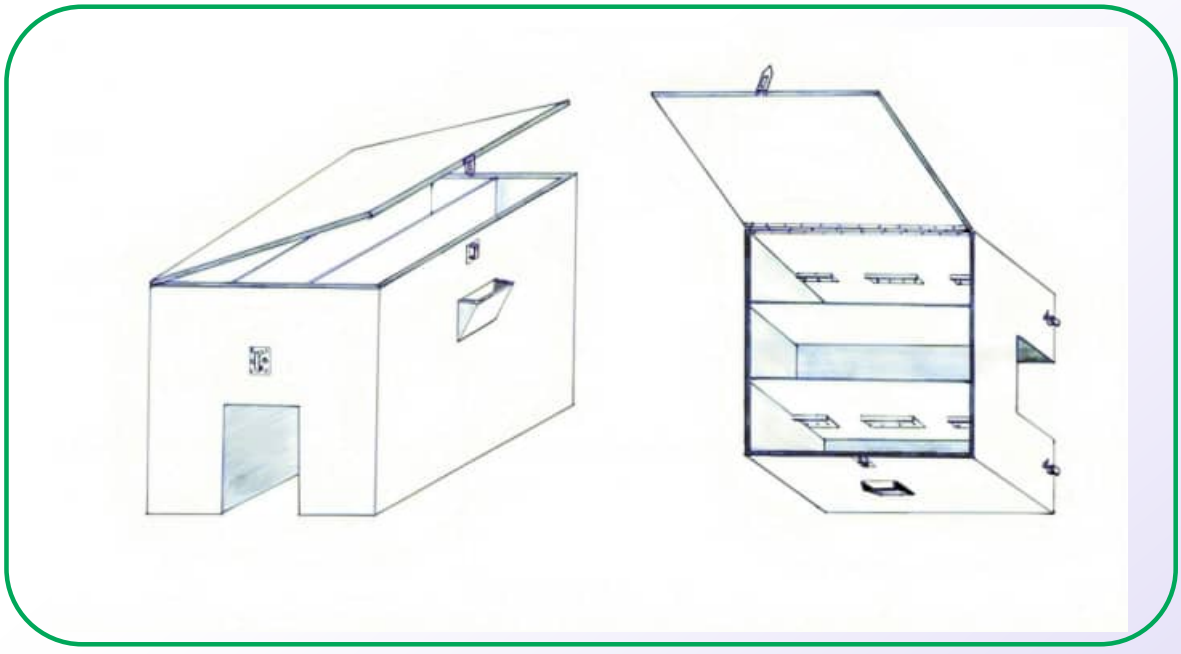


Fig. Container for hygienic transport of meat

Inventor : Rajendran Thomas

INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

सत्यमेव जयते

क्रमांक : 033103559
SL No :

भारत सरकार
GOVERNMENT OF INDIA
पेटेंट कार्यालय
THE PATENT OFFICE

पेटेंट प्रमाणपत्र
PATENT CERTIFICATE
(Rule 74 Of The Patents Rules)

पेटेंट सं. / Patent No.	:	296345
आवेदन सं. / Application No.	:	1480/KOL/2009
फाइल करने की तारीख / Date of Filing	:	29/12/2009
पेटेंटी / Patentee	:	INDIAN COUNCIL OF AGRICULTURAL RESEARCH

प्रमाणित किया जाता है कि पेटेंटी को उपरोक्त आवेदन में यथाप्रकटित A PORTABLE INSULATED CONTAINER FOR HYGIENIC TRANSPORT OF PACKAGED MEAT नामक आविष्कार के लिए, पेटेंट अधिनियम, १९७० के उपबंधों के अनुसार आज तारीख 29th day of December 2009 से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled A PORTABLE INSULATED CONTAINER FOR HYGIENIC TRANSPORT OF PACKAGED MEAT as disclosed in the above mentioned application for the term of 20 years from the 29th day of December 2009 in accordance with the provisions of the Patents Act,1970.

THE PATENT OFFICE GOVT.OF INDIA

अनुदान की तारीख : 27/04/2018
Date of Grant :

पेटेंट नियंत्रक
Controller of Patent

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि इसे बनाए रखा जाना है, **29th day of December 2011**को और उसके पश्चात प्रत्येक वर्ष में उसी दिन देय होगी।
Note. - The fees for renewal of this patent, if it is to be maintained will fall / has fallen due on **29th day of December 2011** and on the same day in every year thereafter.

Technology No. 24

Technology for Processing Pork Momos Which will not Result in Neuro-Cysticercosis

Brief description :

Problem Description : Processing practices followed by the street vendors many times don't result in the inactivation of Cysticercus cellulosae larvae, if present in pork.

Solution Description : Processing technology has been developed to ensure complete inactivation of Cysticercus cellulosae larvae, if present in pork, during the processing of momos. This technology offers the processors to prevent the transmission of cysticercus through their pork products. Accordingly, technology has been developed for processing the pork momos

Inventor : Rajendran Thomas

Technology No. 25

Technology for Processing Restructured Pork Products

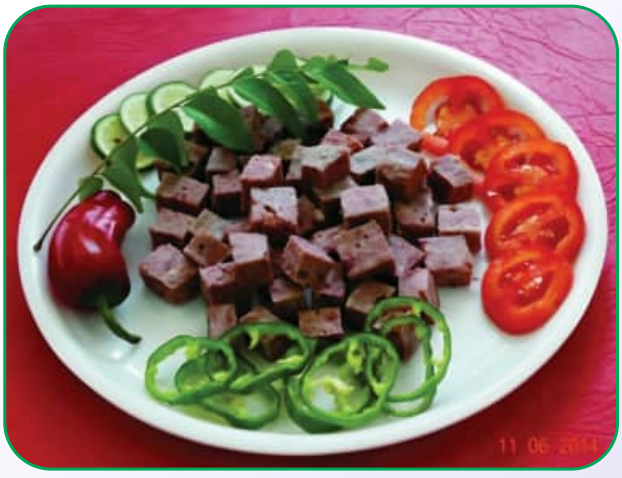
Brief description :

Problem Description : Comminution of pork results in emulsification and the pork tissue becomes very soft. Comminuted pork products could only offer the taste and flavor of pork to the consumers but not the texture or chewiness of intact meat.

Solution Description : Restructuring technology provide ample scope for imparting chewiness in pork products apart form taste and flavour. Thus, consumers will get all the characteristics of pork in the restructured pork products. Accordingly, the technologies for processing following pork products with good consumer acceptance were developed at the R&D pork processing plant.

- Restructured ham slices
- Restructured pork salami
- Restructured pork nuggets
- Restructured pork bites

Technology has also been developed to process these products with different flavors and tastes to provide variety to consumers.



Inventor : Rajendran Thomas

Technology No. 26

Technology for Processing Enrobed Pork Products

Brief description :

Problem Description : Pork products processed using comminution or restructuring technology lacks the crispiness.

Solution Description : Enrobing technology provide ample scope for imparting crispiness in pork products apart from taste and flavour. Thus, consumers will get better eating quality parameters. Accordingly, the technologies for processing following pork products with good consumer acceptance were developed at the R&D pork processing plant.

1. Enrobed pork nuggets
2. Enrobed pork bites

The technology has also been developed to process these products with different flavour and taste to provide variety to the consumers.

Inventor : Rajendran Thomas

Technology No. 27

Technology for Processing Emulsion-Based Pork Products

Brief description :

Problem Description : Pork from aged animals (e.g. those used for breeding purpose) is very tough and the market acceptability is very much limited due to its coarse nature of the fibres. Also, the back fat content in such carcasses will be much higher than the market requirement, due to which the processors need to trim the excess fat layer, which in turn results in revenue loss. In addition, fabrication of pig carcasses results in generation of meat trimmings, which are usually not marketable due to its very small sizes and non uniformity in their shapes.

Solution Description : Emulsification technology provides ample scope for converting the tough meat fibres to soft form. The process also facilitates utilization of excess trimmed fat in a profitable way. This technology also provides the processor the opportunity to utilize the trimmings generated during fabrication process. Accordingly, the technologies for processing following pork products with good consumer acceptance were developed at the R&D pork processing plant.

- Pork frankfurter sausage
- Pork cocktail sausage
- Ham slices
- Pork salami
- Pork nuggets
- Pork burger patties

The technology has also been developed to process these products with different flavor and taste to provide variety to the consumers.

Inventor : Rajendran Thomas

Technology No. 28

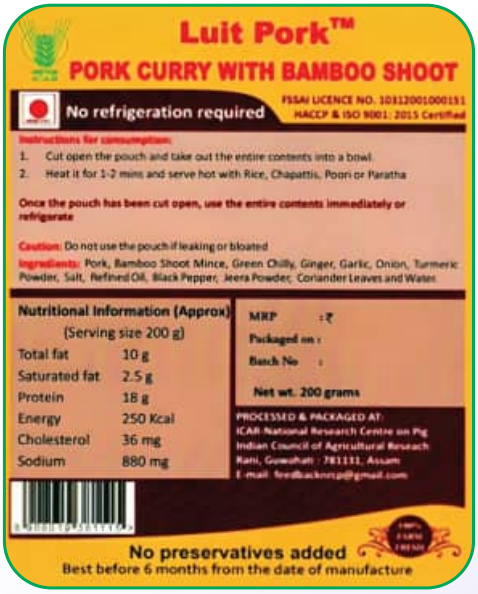
Technology for Processing Shelf Stable Pork Products Using Retort Technology

Brief description :

Problem Description : Pork products, processed using emulsion, restructured or enrobed need cold chain for their marketing and storage, which adds to the cost of the product. Also, provision for continuous supply of electricity in many parts of the country is still a dream.

Solution Description : Retort processing technology offers the scope for processing pork products which are shelf stable at room temperature, thereby permit the marketing of the products without cold chain. Accordingly, technology has been developed for processing the following products:

- Pork curry with bamboo shoot
- Pork vindaloo



Inventor : Rajendran Thomas

Technology No. 29

Nucleofast Viral DNA Isolation Kit

Brief description :

Problem Description : Genomic DNA extraction from postmortem tissue/body fluid samples plays a pivotal role in polymerase Chain Reaction (PCR) based point-of-care routine diagnostics of viral diseases in animals. Thus,viral DNA extraction method plays the central role in speeding up the routine detection protocol in terms of labor intensity, throughput time as well as material cost per sample.

Commonly used methods, such as phenol-chloroform, boiling, and others, have several drawbacks, including being time-consuming**,** costly, and involving hazardous chemicals. As a result, using a PCR-based assay to routinely screen viral DNA from post-mortem tissue samples is not cost-effective or technically feasible. As a result, a simple, quick, and cost-effective assay/kit for isolating viral DNA templates for routine PCR testing is required.

Solution Description : Here we developed a ready to use "Nucleofast Viral DNA isolation kit" for quick extraction of viral DNA from animal post-mortem samples. The developed Nucleofast Viral DNA isolation kit has the following distinguishing features when compared to existing methodologies

- Simplicity : The buffer can be easily prepared without any technical difficulties
- Cost-effectiveness: The estimated cost per sample is INR10-15/- only
- Short handling time: The total time required for DNA extraction is only 5-6 minutes

Inventors :
Rajib Deb, Gyanendra Singh Sengar, Seema Rani Pegu, Swaraj Rajkhowa and Vivek Kumar Gupta

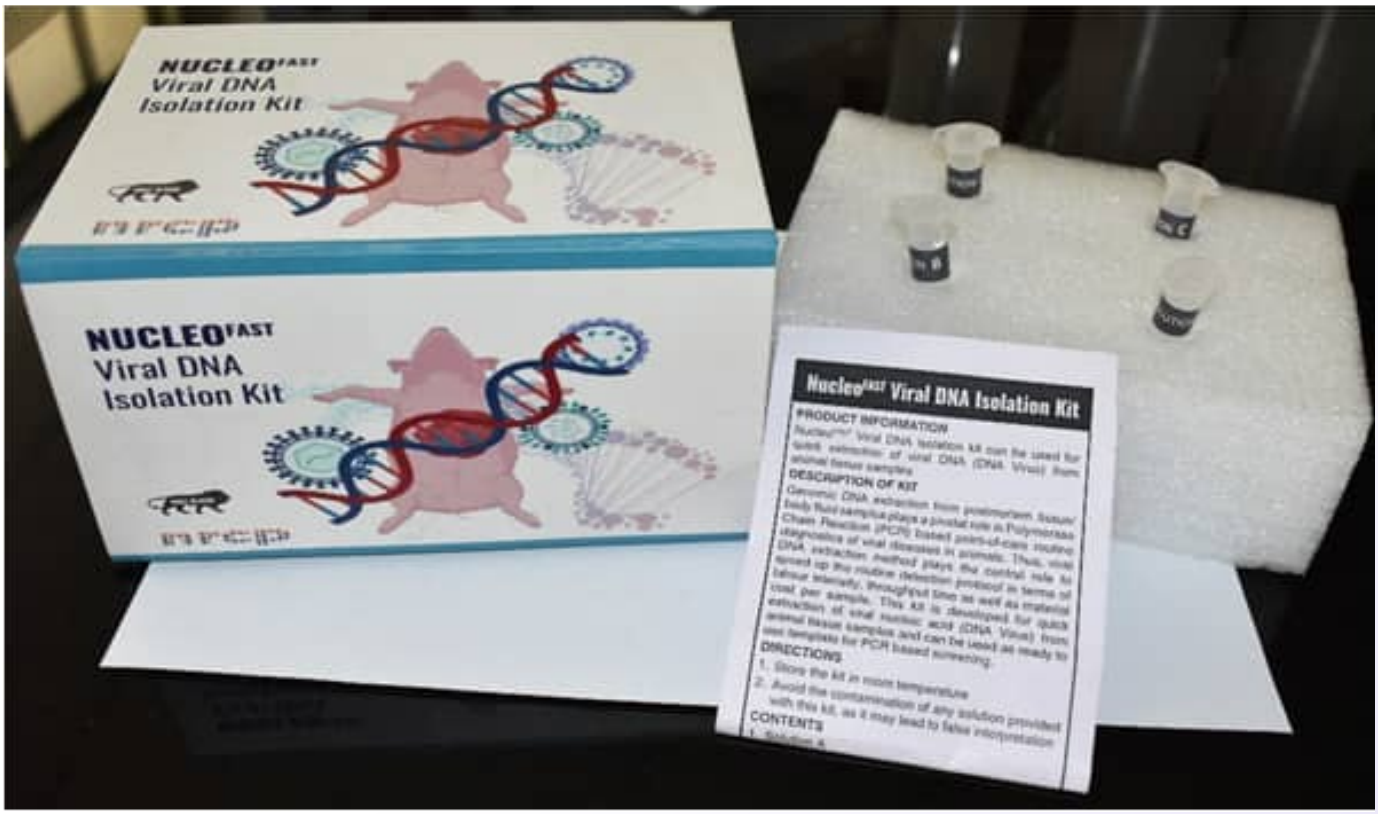


Fig. Nucleofast Viral DNA Isolation Kit

Technology No. 30

Piggyplex (R) CSF, JE & PRRS Assay Kit

Brief description :

Problem Description : Classical Swine Fever (CSF), Japanese encaphalitis and Porcine Reproductive and Respiratory Syndrome (PRRS) are three major transboundary pig diseases that cause significant economic losses for pig farmers. Japanese Encephalitis (JE) is an important vector borne zoonotic disease that causes reproductive losses in pigs. Pig at as an amplifying host for the JE Vires. CSF, JE, and PRRS are all caused by RNA viruses from the *Pestivirus*, *Flavivirus*, and *Arterivirus* families, respectively. According to reports, these viruses co-exists in swine population.

Thus, the development of a low-cost, containment-free, and rapid test for simultaneous detection of CSF, JE, and PRRS in routine postmortem piggery samples is urgently needed.

Solution Description : To detect CSF, JE, and PRRS in porcine samples, a specific set of oligonucleotide primers was designed and combined in a multiplex arrangement. To demonstrate the accuracy of the developed multiplex PCR assay, 413 porcine post-mortem tissue samples were tested.

Each of the CSFV, JEV, and PRRSV target genes was amplified using the designed primers, but no other porcine virus genes were detected. The detection limit of the assay was 10^2-10^3 copies/μl of viral nucleic acid. The presence of viral DNA of PRRSV, CSFV, and JEV is indicated by the detection of 144 bp, 171 bp, and 283 bp fragments in agarose gel electrophoresis, respectively.

The benefit of the assay over existing technologies :

- Cost-effective: Since no expensive equipment is required
- Simultaneous tests for the presence of all three RNA viruses

Inventors :
Seema Rani Pegu, Rajib Deb, Pranab Jyoti Das, Gyanendra Singh Sengar, Swaraj Rajkhowa and Vivek Kumar Gupta

Fig. Piggyplex (R) CSF, JE & PRRS Assay Kit

ICAR-AS-NRCP-Product-2023-074

ICAR

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Dr. Seema Rani Pegu

(Lead Developer)

Associate Developers

Dr. Rajib Deb, Dr. Pranab Jyoti Das, Dr. Gyanendra Singh Sengar
Dr. Swaraj Rajkhowa, Dr. Vivek Kumar Gupta

of

ICAR-National Research Centre on Pig
Guwahati, Assam

has developed the technology

Piggyplex ® CSF, JE & PRRS Assay Kit: Product

16th July, 2023
New Delhi

(Amrish K. Tyagi)
Assistant Director General

(J.K. Jena)
Deputy Director General (Animal Science)

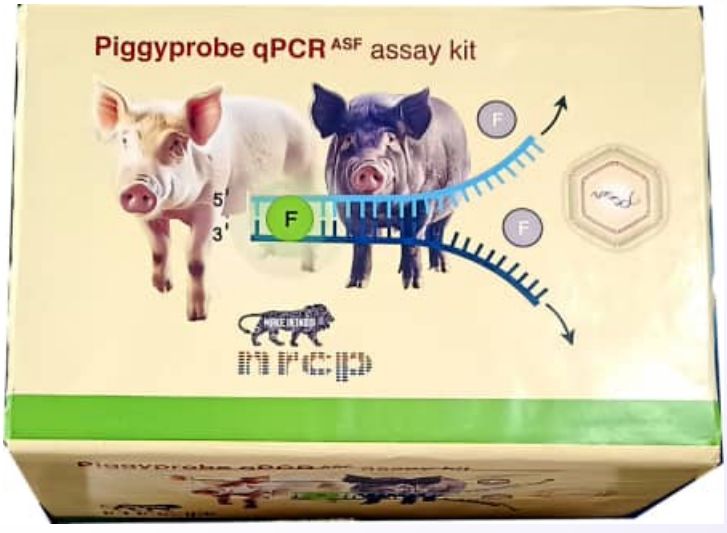
Technology No. 31

Piggyprobe qPCR^{ASF} Assay Kit

Brief description :

Problem Description : Due to its extremely high fatality rate, African swine fever (ASF), which is regarded as the most terrifying swine disease, first appeared in India in 2020. Hence, the development of indigenous rapid and reliable diagnostics is always demanding in the present scenario. So, a reliable, sensitive, and specific quantitative assay for the detection of ASV in clinical specimens is required.

Solution Description : The developed assay can be able to detect the ASF viral load in clinical samples within 30 minutes (post nucleic acid extraction). The primers and probe sequences are specific for the detection of African swine fever virus (ASFV) in clinical samples comprising of a) forward primer (Seq 1), b) reverse primer (Seq 2), c) probe sequence (Seq 3) comprising 23 bases labelled with ROX™ (at 5' end) & BHQ™ (at 3' end). The test is used for quantitative detection of ASFV copy number in clinical samples within 30 minutes using the seq 1-3. The assay is specific for ASFV without any cross-reactivity with other swine viral pathogens. The assay can detect as low as 5 fg of viral DNA.



Inventors :
Seema Rani Pegu, Gyanendra Singh Sengar, Rajib Deb, Pranab Jyoti Das, Swaraj Rajkhowa and Vivek Kumar Gupta

Technology No. 32

Piggyplex (D) ASFV, PCV & PPV Assay kit

Brief description

Problem Description : Given the significant economic impact of ASF (African Swine Fever), PCV2 (Porcine circovirus 2), and PPV (Porcine parvovirus) on the pig industry, a simple, sensitive, and specific diagnostic approach is required to distinguish the viral pathogens. Currently, no convenient and specific diagnostic assay for the simultaneous detection of ASF, PCV2, and PPV infection exists.

Solution Description : This work established a simple, specific, and sensitive multiplex PCR test for detecting and distinguishing ASF, PCV2, and PPV in clinical specimens.The Piggyplex (D) ASFV, PCV & PPV assay kit can simultaneously detect ASF, PCV, and PPV in routine postmortem piggery samples.

Fig. Piggyplex (D) ASFV, PCV & PPV assay kit

Inventors :
Seema Rani Pegu, Rajib Deb, Pranab Jyoti Das, Gyanendra Singh Sengar, Swaraj Rajkhowa and Vivek Kumar Gupta

ICAR-AS-NRCP-Product-2023-073

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Dr. Seema Rani Pegu

(Lead Developer)

Associate Developers

Dr. Rajib Deb, Dr. Pranab Jyoti Das, Dr. Gyanendra Singh Sengar
Dr. Swaraj Rajkhowa, Dr. Vivek Kumar Gupta

of

ICAR-National Research Centre on Pig
Guwahati, Assam

has developed the technology

Piggyplex (D) ASFV, PCV & PPV assay kit: Product

16th July, 2023
New Delhi

(Amrish K. Tyagi)
Assistant Director General

(J.K. Jena)
Deputy Director General (Animal Science)

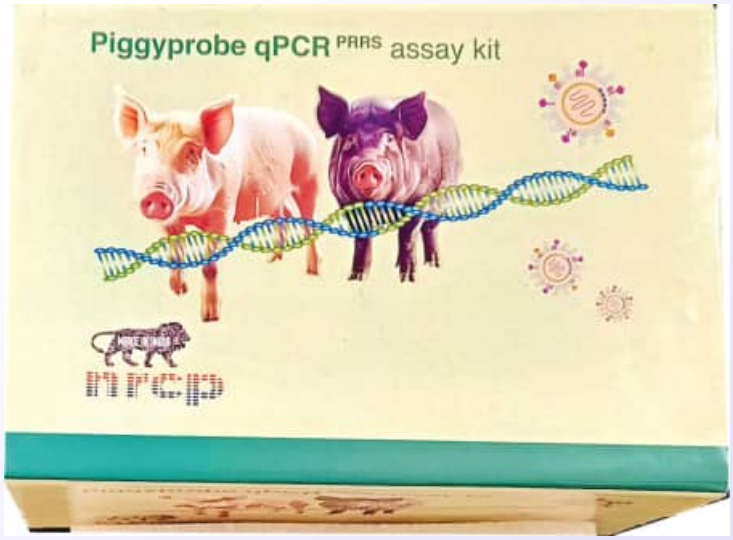
Technology No. 33

qPCR^{TP} Assay for Detection of Porcine Reproductive and Respiratory Syndrome Virus

Brief description :

Problem Description : Porcine Reproductive and Respiratory Syndrome (PRRS) has a significant impact on the health and welfare of pigs and has become enzootic in most pig production areas. Improvements in detection and management of PRRS virus (PRRSV) in production systems continue to be challenging for swine producers and veterinarians. Development of indigenous rapid and reliable diagnostics is always demanding in the present scenario.

Solution Description : Developed assay can detect the PRRS viral load in clinical samples within 30 minutes (post nucleic acid extraction). The primers and probe sequences are specific for detection of PRRSV in clinical samples comprising of a) forward primer (Seq 1), b) reverse primer (Seq 2), c) probe sequence (Seq 3) comprising 23 bases labelled with CY R (at 5' end) & BHQ^{TM} (at 3' end). The test is used for quantitative detection of PRRSV copy number in clinical samples within 30 minutes using the seq 1-3. The assay is specific for PRRSV without any cross reactivity with other swine viral pathogens. The detection limits of the assay is 50 fg copies of standard plasmid DNA containing PRRSV ORF5 gene.



Inventors :
Seema Rani Pegu, Gyanendra Singh Sengar, Rajib Deb, Pranab Jyoti Das, Swaraj Rajkhowa and Vivek Kumar Gupta

Technology No. 34

Boar Semen Preservation and Transportation Box

Brief description :

Problem Description : Artificial Insemination is a technology by which semen is collected form a superior trained boar, and then tested, processed, packed/ stored and inseminated into a receptive female at right time of heat. Initially, A.I appeared in order to provide the genetic improvement of animals and to solve sanitary problems. However, a significant improvement in both productive and economical aspects was later observed, as making possible acceleration in diffusion of the desirable characteristics of the reproducers with high genetic value. This occurred due to a great potential of AI in making possible the use of biotechnology such as those related to technology of the semen, preservation of embryos, and others. The AI growth is linked to expansion of the pig production at industrial scale. Considering the AI advantages, compared with the natural mating, the implantation of this one substantially facilities the reproductive management of herds with high number of sows.

However, the bottleneck is the preservation of boar semen under required controlled conditions such as temperature. The cost and easier availability of existing technologies is under question under Indian Local conditions. Hence, the designed technology is designed in such a local way that boar liquid semen doses can be stored and transported at lower cost. The box with designed electric circuit and thermostat can be designed at manufacturer's site with variable capacity and dimensions.

Solution Description : The required temperature for boar liquid semen can be achieved and maintained using semiconductor plates

Inventors:
Sunil Kumar, Rafiqul Islam, Pranab Jyoti Das, Keshab Barman, Santanu Banik, Swaraj Rajkhowa and Vivek Kumar Gupta

based on Peltier effect. The cooled side plate, double air fan flow, aluminum heat sink, cooled gel packs in joint operation are used to maintain the required temperature. Hence, the boar liquid semen can be preserved in the designed technology. The designed technology can be used for preserving the boar liquid semen at different AI centers, KVKs, Animal Husbandry Hospital/Dispensaries, Veterinary and Animal Science Academic and Research Institutions, by Entrepreneurs. From these centers/institutes, liquid semen doses can be supplied to farmers directly.

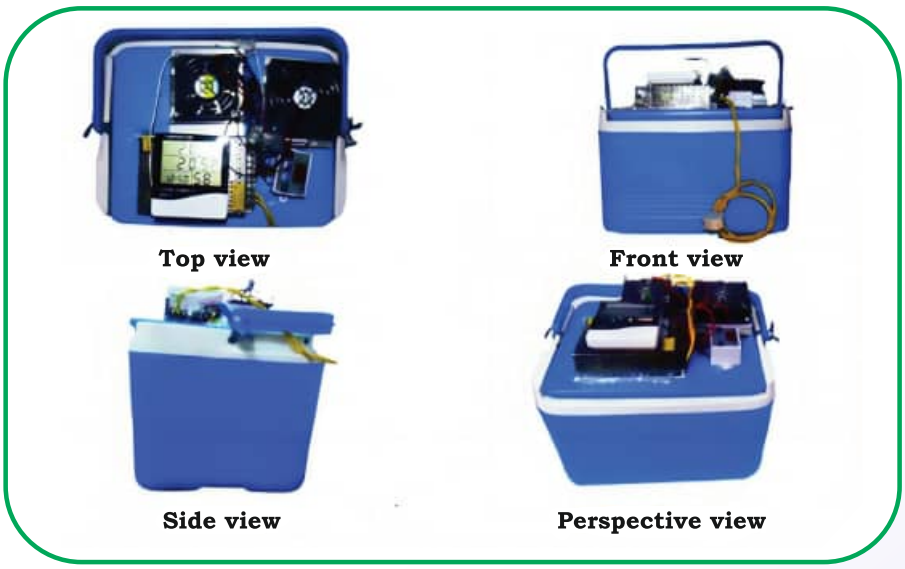


Fig. Different views of Boar Semen Preservation and Transportation Box with attached electric circuit and thermostat

Fig. Inside view of the designed device

Technology No. 35

Boar Semen Preservation Cabinet

Brief description :

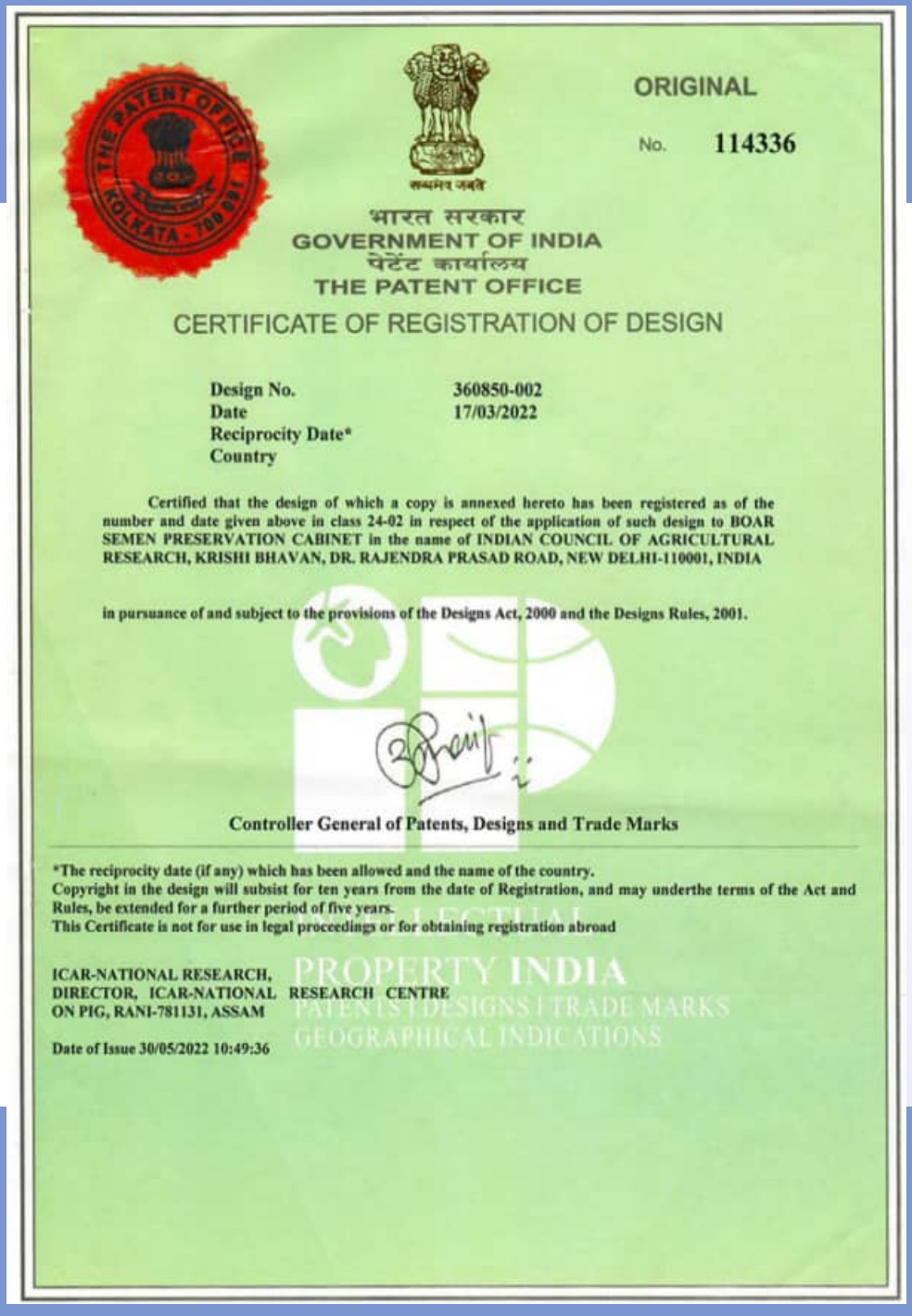
Problem Description : Preservation of extended boar semen at 15-17°C is one of the critical steps for successful artificial insemination programme in pigs. The extended boar semen can't be stored at refrigeration temperature (4-7°C) because of spermatozoa susceptibility to cold shock. Hence, the refrigerator available at farmers' home cannot be used for the purpose of semen preservation. However, the household refrigerator can be modified to maintain the temperature of 15-17 °C for semen preservation. The refrigerator can be modified using external digital temperature controller, cooler, heater, and modified electric circuit. The cabinet can adjust the temperature in a variable range from 10-50 °C.

Solution Description :

- Reduction of cost of imported cabinets
- Easier and cheaper availability in Indian Market
- Wide range of adjustable temperature
- Can be done at farmers door step

Fig. Boar Semen Preservation Cabinet

Inventors :
Sunil Kumar, Rafiqul Islam, Pranab Jyoti Das, Keshab Barman, Santanu Banik, Swaraj Rajkhowa and Vivek Kumar Gupta



ORIGINAL

No. 114336

भारत सरकार
GOVERNMENT OF INDIA
पेटेंट कार्यालय
THE PATENT OFFICE

CERTIFICATE OF REGISTRATION OF DESIGN

Design No.	360850-002
Date	17/03/2022
Reciprocity Date*	
Country	

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class 24-02 in respect of the application of such design to BOAR SEMEN PRESERVATION CABINET in the name of INDIAN COUNCIL OF AGRICULTURAL RESEARCH, KRISHI BHAVAN, DR. RAJENDRA PRASAD ROAD, NEW DELHI-110001, INDIA

in pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

Controller General of Patents, Designs and Trade Marks

*The reciprocity date (if any) which has been allowed and the name of the country.
Copyright in the design will subsist for ten years from the date of Registration, and may underthe terms of the Act and Rules, be extended for a further period of five years.
This Certificate is not for use in legal proceedings or for obtaining registration abroad

ICAR-NATIONAL RESEARCH,
DIRECTOR, ICAR-NATIONAL RESEARCH CENTRE
ON PIG, RANI-781131, ASSAM

Date of Issue 30/05/2022 10:49:36

Technology No. 36

Loop-Mediated Isothermal Amplification (LAMP) and Polymerase Spiral Reaction (PSR) based Rapid Visual Assays for Rapid Detection of African Swine Fever Virus

Brief description :

Problem Description : African Swine Fever (ASF) is a dreaded contagious viral disease of domestic pigs as well as wild boars representing a significant threat to the global piggery industry. Owing to the lack of effective vaccines, the current control measures and eradication strategies rely on early detection and stringent stamping-out procedures.

Solution Description

In the present study, we developed two independent isothermal amplification assay, namely loop-mediated isothermal amplification (LAMP) and polymerase spiral reaction (PSR) for quick visualization of ASF virus (ASFV) genome in clinical samples. The analytical sensitivity of the LAMP and PSR was found to be 50 pg and 50 fg, respectively. Both the visual assays were found to be specific only for ASFV but not for other porcine viral pathogens. A total 165 number of suspected clinical samples were tested using the developed visual assays in parallel with the OIE recommended conventional PCR Based assay as reference. The relative accuracy, relative specificity and relative diagnostic sensitivity for LAMP vs PSR was found to be 95.37% vs 102.48%, 97.46% vs 101.36% and 73.33% vs 113.33%, respectively. The Cohen kappa index value was calculated and found to be higher for PSR (1.15) in comparison to LAMP (0.7) based visual assay for detecting ASFV in clinical samples. The developed isothermal assays can become molecular diagnostic methods of choice for rapid and sensitive detection of ASF viral DNA in resource constrained settings.

Inventors :
Rajib Deb, Gyanendra Singh Sengar, Seema Rani Pegu, Soumendu Chakravarti Swaraj Rajkhowa, Pranab Joyti Das and Vivek Kumar Gupta

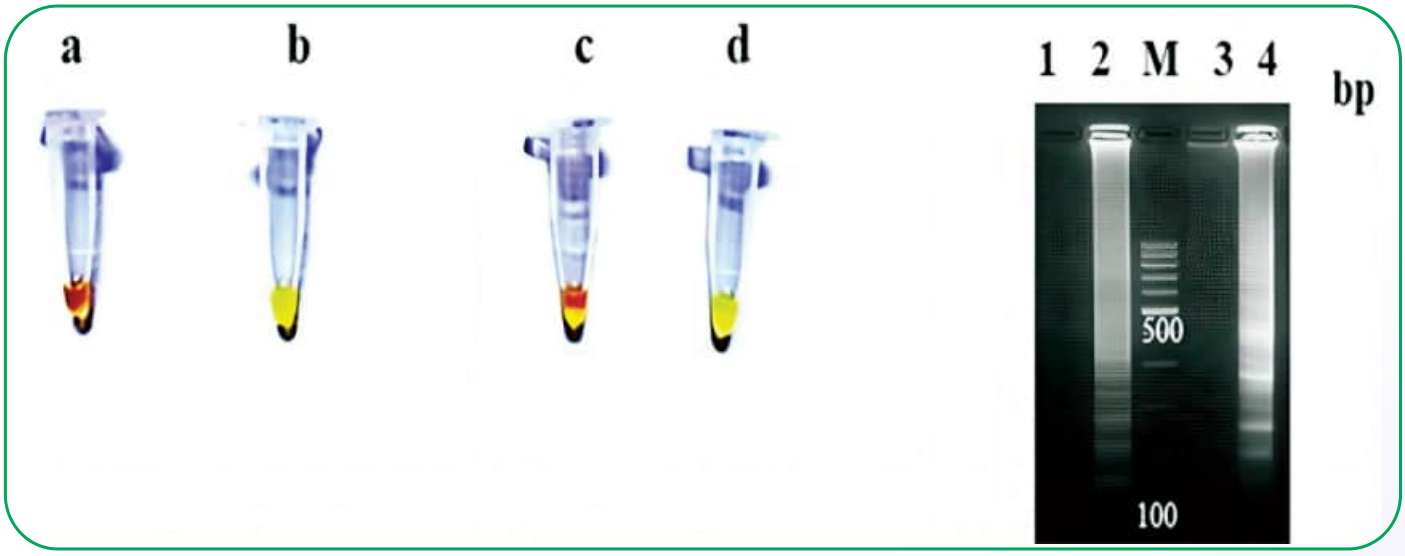


Fig. Visual detection of color changes for LAMP (a: NTC; b: PTC) and PSR (c: NTC; d: PTC) and **development of ladder pattern** (LAMP: 1: NTC and 2: PTC; PSR: 3: NTC and 4: PTC) . NTC: No template control; PTC: ASF positive

Technology No. 37

Triplex Assay for Simultaneous Detection of *Escherichia coli* Methicillin Resistant and Sensitive *Staphylococcus Aureus* in Raw Pork Samples

Brief description :

Problem Description : *Escherchia coli* is a bacterium that acts as a hygiene indicator in pig carcasses after slaughter; the degree of *E.coli* contamination in live pig slaughter has been proven to be critical to consumer health. The presence of *S.aureus* in food can lead to the formation of enterotoxins, which remain in foods even after the germs themselves have been eliminated by cooking, resulting in staphylococcal food poisoning. *S.aureus* can develop resistance to numerous medications, including methicillin and has thus been designated as a "priority pathogen" by the World Health Organization. Since 2005, the livestock-associated methicillin-resistant *S.aureus* (LA-MRSA) clonal complex 398 (CC398) has emerged as the dominant European clone, with pig serving as a reservoir. The presence of LA-MRSA CC398 in food-producing animals is cause for concern because to the possibility of direct transmission to human who come into touch with sick animals and/or their products, as well as food contamination. MRSA has been linked to raw pork meat and meat products. Therefore, it is vital to design an accurate and specific diagnostic tool for identifying those food-borne pathogens in animal products.

Solution description : The technology involved a single tube PCR based simultaneous detection of *E.coli*, methicillin-sensitive and resistant *Staphylococcus aureus* in pork samples with limit of detection 10^2 ng/µl

Inventors :
Rajib Deb, Ranjeet Parihar, Seema R. Pegu, Gyanendra Singh Sengar, Swaraj Rajkhowa, Pranab Jyoti Das and Vivek Kumar Gupta

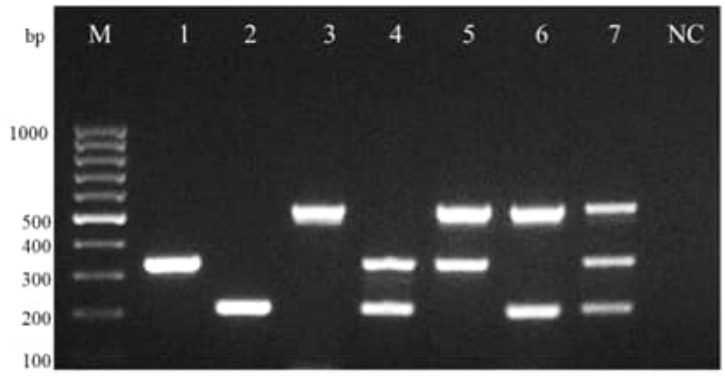


Fig. Simplex and multiplex assay for detecting *Staphylococcus aureus* and *Escherichia coli* in spiked pork meat samples. M: Molecular weight marker; L1: *Uid*A gene (335 bp) of *E.coli*; L2: *Spa*A gene (209 bp) of MRSA; L3: *mec*A gene (533 bp) of MRSA; L4: *Uid*A gene of E. coli and *Spa*A gene of MRSA; L5: *Uid*A gene of *E.coli* and *mec*A gene of MRSA; L6: *mec*A gene of MRSA and *Spa*A gene of MRSA; L7: *mec*A gene of MRSA, *Uid*A gene of *E.coli* and *Spa*A gene of MRSA.

Technology No. 38

Dirrocure: Herbal Anti-Diarrhoeal Feed Supplement

Brief description :

Problem Description : In pig farming, piglet diarrhea is the most common problem just after weaning because of changes in feed as well as exposure to a new environment. It is one of the most common causes of economic loss to the pig farmer arising from stunted growth, poor feed conversion efficiency, delayed maturity, and even death as a result of diarrhea. Though antibiotics can be used to stop diarrhea, they lead to the development of antibiotic-resistant bacteria which in the future may aggravate the diseases in the farm. Therefore, to stop such problem of antimicrobial resistance of microbes through the use of antibiotics, ICAR-NRC on Pig has developed an herbal feed supplement to stop piglet diarrhea.

Solution description : The herbal mixture developed as a pig feed supplement, has shown to have positive anti-diarrhoeal properties in piglets. The major advantages can be listed as

1. It prevents piglet diarrhoea
2. It increases the production performances
3. Increase the profit of farmers

"Dirrocure" as the name indicate is a herbal mixture with antidiarroheal properties in piglets. The composition and dosage of this oral medication has been standardised after field trials.

Inventors :
Keshab Barman, Seema Rani Pegu, Rajib Deb, Pranab Jyoti Das, Nitin M. Attupuram and Vivek Kumar Gupta

Technology No. 39

AMRTester: Culture free Herbal Aided Antimicrobial Resistant Tester in Livestock Products, Biological Samples and Farm Waste

Brief description :

Problem Description : The increased antimicrobial resistance (AMR) has not only seriously jeopardized the disease management practices in farm animals, but also poses a greater level of threat on compromising human health. It is projected that by 2050 the annual global mortality due to antimicrobial resistance will be ten million, surpassing the mortality rates of cancer (Wellcome Trust UK, 2014). India consumed 3% of antimicrobials for livestock production in 2010 and it is assumed that this consumption will grow by 4% at the end of 2030. In the UK, among antibiotic usage by food-producing animal species Piggery sector uses 110mg/kg biomass while the dairy sector use 17 mg/kg biomass, the beef sector uses 21mg/kg biomass, broilers sector utilizes 12 mg/kg biomass. Routine screening of livestock products, biological samples, and animal farm waste is of utmost importance for AMR surveillance and their analysis of their associated risk factors in human food chain. However, currently available culture-based screening of antimicrobial sensitivity is laborious, cost-effective and time-consuming.

Solution Description : The developed technology can be routinely used for regular screening of livestock products (milk, meat) , biological samples (nasal swab, rectal swab, fecal specimens etc.) and farm waste (drainage water, faecal materials, soil samples, slaughterhouse effluents and other waste materials) samples without overnight culture based existing methodology. This process is simple, smarter and quick without using of any hazardous chemicals. We have standardized the time kinetics for making the assay rapid and specific.

Inventors :
Rajib Deb, Seema Rani Pegu, Gyanendra Singh Sengar, Nitin M. Attupuram, Ningthoukhongjam Linda, Swaraj Rajkhowa, Pranab Jyoti Das and Vivek Kumar Gupta

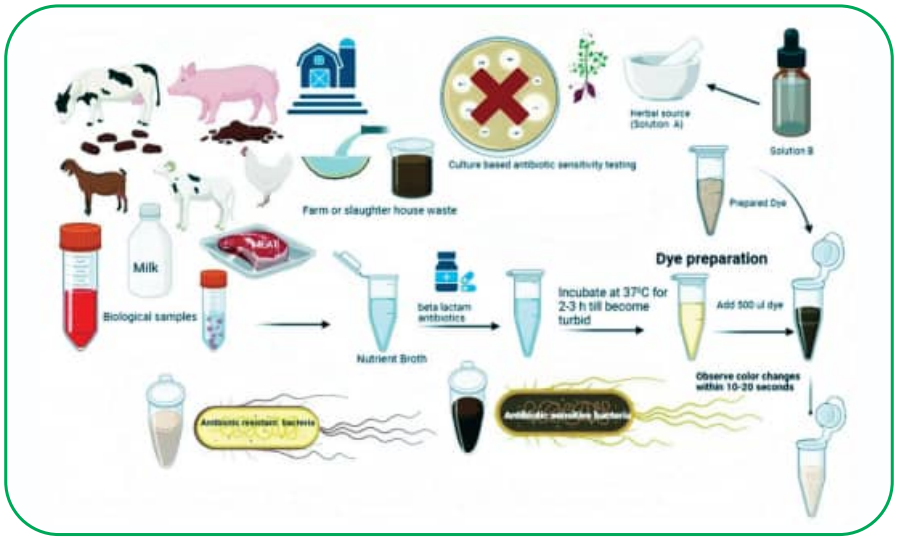


Fig. Schematic representation of the developed assay for detection of antimicrobial resistant (beta lactam antibiotics) without culture based antimicrobial sensitivity testing

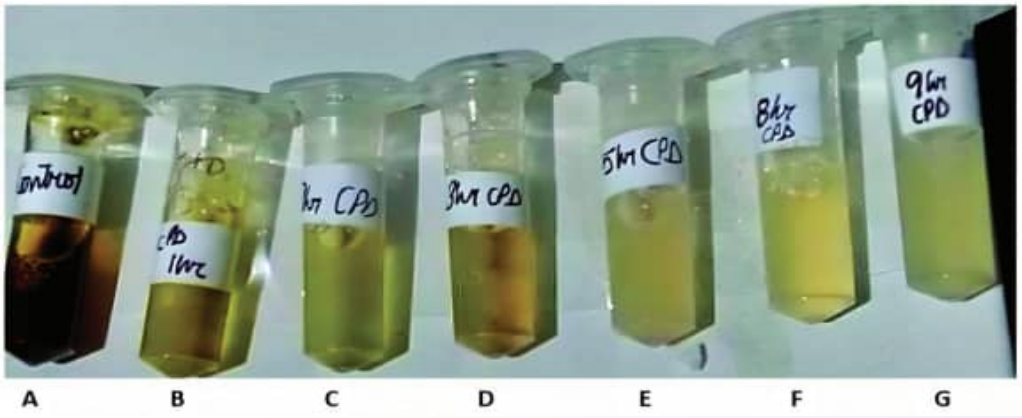


Fig. Incubation hour kinetics for antimicrobial resistant bacteria against beta lactam antibiotics (penicillin, cephalosporin and carbapenem groups of antibiotics) and changes in the dye color. A: Mock control (dye itself); B-G: Changes of color in 1 hr, 2 hr, 3hr, 5hr, 8hr and 9hr incubation of AMR positive bacterial culture with selective antibiotic.

Technology No. 40

qPCR^{TP} Assay for Detection of Classical Swine Fever Virus

Brief description :

Problem Description : Classical swine fever (CSF), caused by a Pestivirus, and is one of the leading causes of economic losses in pig production. The national and international traffic of live pigs and their by-products poses a concern to CSF-free areas or countries. Many symptoms are not solely connected with the disease and may vary according to the virus strain, age, and health state of the animals, thus laboratory identification of CSF is critical. Such identification must be quick and precise, especially in nations with established eradication initiatives, because quick diagnosis reduces the potential for transmission for uninfected herds and so avoids disease spread. No indigenous real time assay kit is available so far for detection of CSF in porcine clinical samples. Development of indigenous rapid and reliable diagnostics is always demanding in the present scenario.

Solution Description : Developed assay can be able to detect the CSF viral load in clinical samples within 30 minutes (post nucleic acid extraction). The primers and probe sequences are specific for detection of CSFV in clinical samples comprising of a) forward primer (Seq 1), b) reverse primer (Seq 2), c) probe sequence (Seq 3) comprising bases labelled with XX (at 5' end) & YY (at 3' end). The test is used for quantitative detection of CSFV copy number in clinical samples within 30 minutes using the seq 1-3. The assay is specific for CSFV without any cross reactivity with other swine viral pathogens. The detection limit of the assay was 50fg copies of standard plasmid DNA containing CSFV specific gene.

Inventors :
Rajib Deb, Seema Rani Pegu, Gyanendra Singh Sengar , Pranab Jyoti Das, Swaraj Rajkhowa and Vivek Kumar Gupta

Technology No. 41

Pregnancy Diagnosis Kit for Pigs

Brief description :

Problem Description : One of the major issues in pig rearing both at organized pig farms and farmers' field is the early diagnosis of pregnancy. Early identification of pregnancy will facilitate planning of breeding, management and marketing of pigs. Until now there are no kits or tests available for early detection of pregnancy in pigs. One non invasive method presently available is through ultrasonography, which is having a limited access in farmers field and organized farms and requires specialized equipment and knowledge, besides being expensive.

Solution Description : A solution for early and rapid detection of pregnancy in pigs is presented through a colour reaction between a reagent and urine sample. Mixing urine with colour reagent resulting in production of reddish-brown precipitate within a specified test window period indicates positive pregnancy. The proposed kit includes a tube containing colour reagent to which a specific amount of urine from test animal is added and reading is taken by direct observation, which makes the test can be used in organized farm and farmers field without much requirement of any specialized knowledge.

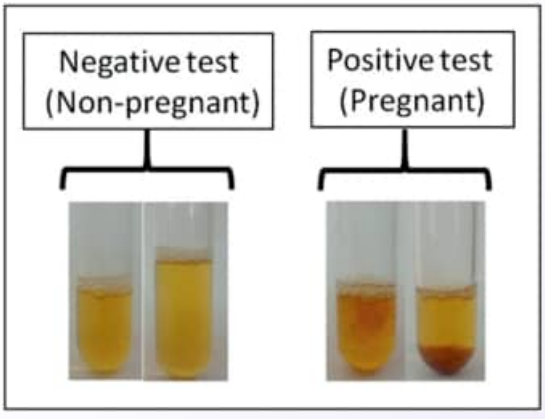


Fig. Precipitate formation at the end of test window

Inventors :
N H Mohan, Vivek Kumar Gupta, Sunil Kumar and Jaya

Technology No. 42

Pig Hair Fibre based Biocomposite and a Method for its Preparation

Brief description :

Problem Description : The hair fibre or bristle is a by-product of humane slaughter of pigs used for manufacture of domestic and industrial products, mostly different kinds of brushes. Most of the hair fibres from millions of pigs slaughtered worldwide are discarded as waste. The value addition of the fibres is very less and provides immense opportunity for manufacturing of utility products and is an example of generating wealth from waste. Our previous study has shown that the pig hair fibre has tensile properties similar to that of wool. Therefore, a solution is proposed through use of pig hair fibre or bristle for the preparation of natural fibre-based biocomposite through the application of appropriate technology.

Solution Description :

Pig hair/bristle-based bio composite presents one of the options for the utilization of pig hair fibre. A process and technology for the development of polystyrene-based biocomposite was developed using a traditional pressure moulding. The mould allows biocomposite to be made in different shapes and sizes. The use of natural fibres such as pig hair fibre has the advantage of promoting sustainable and environment-friendly practices because of their carbon neutrality, and freedom from fossil fuels.The technology was developed as a collaboration through ICAR-NRC on Pig and ICAR-NINFET.

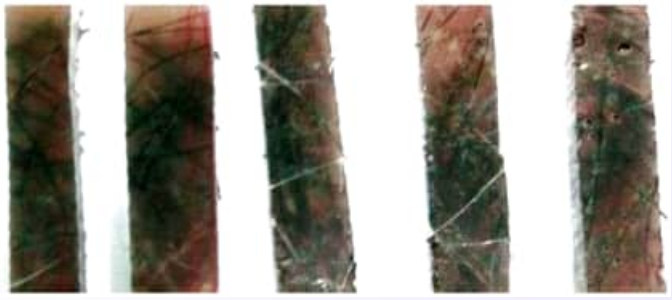


Fig. Pig hair based biocomposite
(Moulded as strips for representative/testing purpose)

Inventor : N.H. Mohan, Lakshmanan Ammayappan*, Dilip Kumar Sarma and Debasis Nag*

****ICAR-National Institute of Natural Fibre Engineering and Technology***

INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

सत्यमेव जयते

क्रमांक : 033113983
SL No :

भारत सरकार
GOVERNMENT OF INDIA
पेटेंट कार्यालय
THE PATENT OFFICE

पेटेंट प्रमाणपत्र
PATENT CERTIFICATE
(Rule 74 Of The Patents Rules)

पेटेंट सं. / Patent No.	:	354534
आवेदन सं. / Application No.	:	201631026604
फाइल करने की तारीख / Date of Filing	:	04/08/2016
पेटेंटी / Patentee	:	INDIAN COUNCIL OF AGRICULTURAL RESEARCH

प्रमाणित किया जाता है कि पेटेंटी को उपरोक्त आवेदन में यथाप्रकटित PIG HAIR FIBRE BASED BIOCOMPOSITE AND A METHOD FOR ITS PREPARATION नामक आविष्कार के लिए, पेटेंट अधिनियम, १९७० के उपबंधों के अनुसार आज तारीख 4th day of August 2016 से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled PIG HAIR FIBRE BASED BIOCOMPOSITE AND A METHOD FOR ITS PREPARATION as disclosed in the above mentioned application for the term of 20 years from the 4th day of August 2016 in accordance with the provisions of the Patents Act,1970.

THE PATENT OFFICE GOVT.OF INDIA

अनुदान की तारीख : 28/12/2020
Date of Grant :

पेटेंट नियंत्रक
Controller of Patent

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि इसे बनाए रखा जाना है, **4th day of August 2018** को और उसके पश्चात प्रत्येक वर्ष में उसी दिन देय होगी।
Note. - The fees for renewal of this patent, if it is to be maintained will fall / has fallen due on 4th day of August 2018 and on the same day in every year thereafter.

Technology No. 43

LAMP Primer Combination for Rapid Visual Detection of *Streptococcus Suis* from Pigs and Application Thereof

Brief description:

Problem Description:

Loop mediated isothermal amplification (LAMP) is a simple, rapid, highly specific and cost-effective single tube technique for the amplification of DNA. LAMP has the potential to be used as a simple screening assay in the field or at the point of disease outbreak by clinicians. It may be a useful method for infectious disease diagnosis particularly in developing countries. Currently, this method has been widely applied to the detection of pathogenic microorganisms and parasites but the same was not available for detection of *S.suis*. Therefore, we isolated the native strain of Streptococcus suis, characterized and designed a novel LAMP protocol suitable for its detection in field conditions with minimum laboratory facilities.These primers are novel, self designed by the inventors. Their use would ease the detection of *S.suis* in particular and biological samples containing S. suis in general and hence having commercial implications.

Solution Description:

The present invention discloses a loop-mediated isothermal amplification (LAMP) detection method for *Streptococcus suis* and a special primer set and its application thereof. The special primer set contains a primer combination consisting of six primers, namely a forward outer primer (F3), a backward outer primer (B3), a forward inner primer (FIP), a backward inner primer (BIP) and a forward loop primer (LF) and a backward loop primer (LB). The present invention pertains to methods of molecular biology detection of bacteria in the field of biotechnology and particularly relates to an LAMP visualized detection method based on *Streptococcus suis* glutamate dehydrogenase (*gdh*) gene. The LAMP detection method can give

Inventors :
Swaraj Rajkhowa, Manjisa Choudhury, Seema Rani Pegu and Nihar Ranjan Sahoo

quicker, convenient and efficient detection of *Streptococcus suis* with high specificity and sensitivity under the isothermal condition. This can be used for detecting pure bacterial samples, biological samples from pigs such as heart fluid and tissues. The detection method provided by the invention does not need expensive instruments, simple in operation and can even be used in field situation.

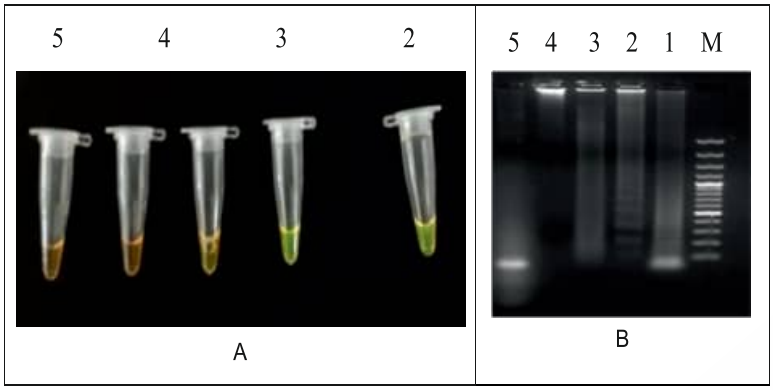


Fig. Sensitivity assessment of the LAMP assay for *S. suis* by serial dilution of genomic DNA. (A) Visual examination of LAMP products by adding SYBR Green I and (B) Agarose gel electrophoresis of amplified products. Lanes 1: 20ng, Lane 2: 2ng, Lane 3: 200pg, Lane 4: 20pg, Lane 5: 2pg and Lane N: no template (negative control); lane M: GeneRuler 100 bp DNA ladder (Thermo Scientific).


पेटेंट कार्यालय,भारत सरकार
पेटेंट प्रमाण पत्र
The Patent Office, Government Of India
Patent Certificate
पेटेंट सं. / Patent No. : 495923
आवेदन सं. / Application No. : 201931040074
फाइल करने की तारीख / Date of Filing : 03/10/2019
पेटेंटी / Patentee : ICAR-NATIONAL RESEARCH CENTRE ON PIG
It is hereby certified that a patent has been granted to the patentee for an invention entitled *LAMP PRIMER SYSTEM FOR RAPID VISUAL DETECTION OF STREPTOCOCCUS SUIS FROM PIGS AND APPLICATION THEREOF*, as disclosed in the above mentioned application for the term of 20 years from the 3rd day of October 2019 in accordance with the provisions of the Patents Act,1970.
Date of Grant : 08/01/2024
Controller of Patents
Note : The fees for renewal of this patent, if it is to be maintained, will fall / has fallen due on 3rd day of October 2021 and on the same day in every year thereafter.

Technology No. 44

A Corral Apparatus and Method for Transport of Animals

Brief description:

Problem Description:

The transportation of animals, particularly pigs, often presents challenges related to animal welfare, safety, and efficiency. The transportation of animal is a common animal husbandry practice. Traditional methods can induce significant stress, physical injuries, and increase the risk of disease transmission. Confinement, novel environments, and handling procedures inherent to transportation can induce significant physiological and psychological stress in animal. Rough handling, overcrowding, and in-transit injuries can result in various physical traumas, such as bruises, lacerations, and fractures. Elevated ambient temperatures during transport can exacerbate stress, increase the risk of heat stress, and compromise animal health and welfare. High-density transportation environments can facilitate the transmission of infectious diseases, posing risks to both transported animals and other livestock. Poorly maintained or loaded transport vehicles can increase the risk of accidents, endangering both animal welfare and human safety. Inefficient loading and unloading procedures can increase transportation time, labour costs, and reduce overall operational efficiency. The transportation of animals is subject to stringent regulations governing vehicle design, animal welfare standards, and biosecurity protocols.

Solution Description:

A Corral apparatus and method for transport of animals offer a solution to the challenges related to animal transportations. This proposes a novel corral design and transportation method aimed to these challenges. The present invention consists of a corral apparatus which can be filled into vehicle, trailer or such movable machines for

Inventors :
NH Mohan, Madan Kumar Tamuli, Rajendran Thomas, Anubrata Das, KM Bujarbaruah

safe and comfortable transport of animals. The corral is specifically designed to create a calm and secure environment for the animals during transport, provide a safe and stable structure to prevent physical harm. It also optimizes loading, unloading, and overall transportation processes that reduce the risk of disease transmission between animals and to the environment. It is customizable to accommodate different animal and sizes and ensures proper airflow and temperature control. Prevents injuries and maintains hygiene, Facilitates safe loading and unloading, provides sustenance during transport. It minimizes handling stress for the animals: Ensures the well-being of the animals throughout the journey. The present invention illustrates an economically feasible method and a corral apparatus for long distance transport of animals.

Fig. Corral Apparatus for Transport of Animals

INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

सत्यमेव जयते

क्रमांक : 033108014
SL No :

भारत सरकार
GOVERNMENT OF INDIA
पेटेंट कार्यालय
THE PATENT OFFICE

पेटेंट प्रमाणपत्र
PATENT CERTIFICATE
(Rule 74 Of The Patents Rules)

पेटेंट सं. / Patent No.	:	319634
आवेदन सं. / Application No.	:	1479/KOL/2009
फाइल करने की तारीख / Date of Filing	:	29/12/2009
पेटेंटी / Patentee	:	INDIAN COUNCIL OF AGRICULTURAL RESEARCH

प्रमाणित किया जाता है कि पेटेंटी को उपरोक्त आवेदन में यथाप्रकटित A CORRAL APPARATUS AND METHOD FOR TRANSPORT OF ANIMALS नामक आविष्कार के लिए, पेटेंट अधिनियम, १९७० के उपबंधों के अनुसार आज तारीख 29th day of December 2009 से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled A CORRAL APPARATUS AND METHOD FOR TRANSPORT OF ANIMALS as disclosed in the above mentioned application for the term of 20 years from the 29th day of December 2009 in accordance with the provisions of the Patents Act,1970.

THE PATENT OFFICE GOVT.OF INDIA

अनुदान की तारीख : 31/08/2019
Date of Grant :

पेटेंट नियंत्रक
Controller of Patent

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि इसे बनाए रखा जाना है, **29th day of December 2011**को और उसके पश्चात प्रत्येक वर्ष मे उसी दिन देय होगी।
Note. - The fees for renewal of this patent, if it is to be maintained will fall / has fallen due on **29th day of December 2011** and on the same day in every year thereafter.

Technology No. 45

Apparatus for Surface Microbial Decontamination of Meat

Brief description:

Problem Description:

Microbial contamination poses a significant threat to the safety and quality of meat products. This issue can lead to severe consequences. Contaminated meat can harbour harmful bacteria, viruses, and parasites that can cause food borne illnesses in consumers. Microbial growth accelerates spoilage, reducing the shelf life of meat products and increasing economic losses. Stringent food safety regulations require effective microbial control to ensure product safety. Traditional methods of decontamination, such as chemical sanitizers often have limitations particularly those forming bio films, can resist traditional treatments. Chemical sanitizers may leave residues on meat surfaces, raising food safety and environmental concerns.

Solution Description:

To address these challenges, an innovative apparatus has been developed to effectively decontaminate meat surfaces without compromising quality or safety. This advanced technology offers a comprehensive solution to the problem of microbial contamination in meat. The apparatus provide a simple, integrated and compact system and method of decontamination and processing of wide variety of carcass including that pork, chicken, goat while being held in a single chamber of the system to enable tandem or sequential steps of processing of such carcass to relieve its microbial load and hence improve the microbial quality of meat. The working of apparatus involves a combination of processing steps of steam chilled water, hot air enabled in tandem or sequentially by the system for processing the carcass held in said single chamber in the system that would quickly

Inventors :
Rajendran Thomas and Vivek Kumar Gupta

decontaminate meat without adversely affecting the sensory properties and physico-chemical characteristic of meat. The apparatus utilizes minimal amount of electrical and heat energy per cycle. The total time of exposure to meat to steam, chilled water and hot water is less than 2 min. The steam chamber can be worked with 4-5 litres of water and it is sufficient for 10 decontamination cycles.

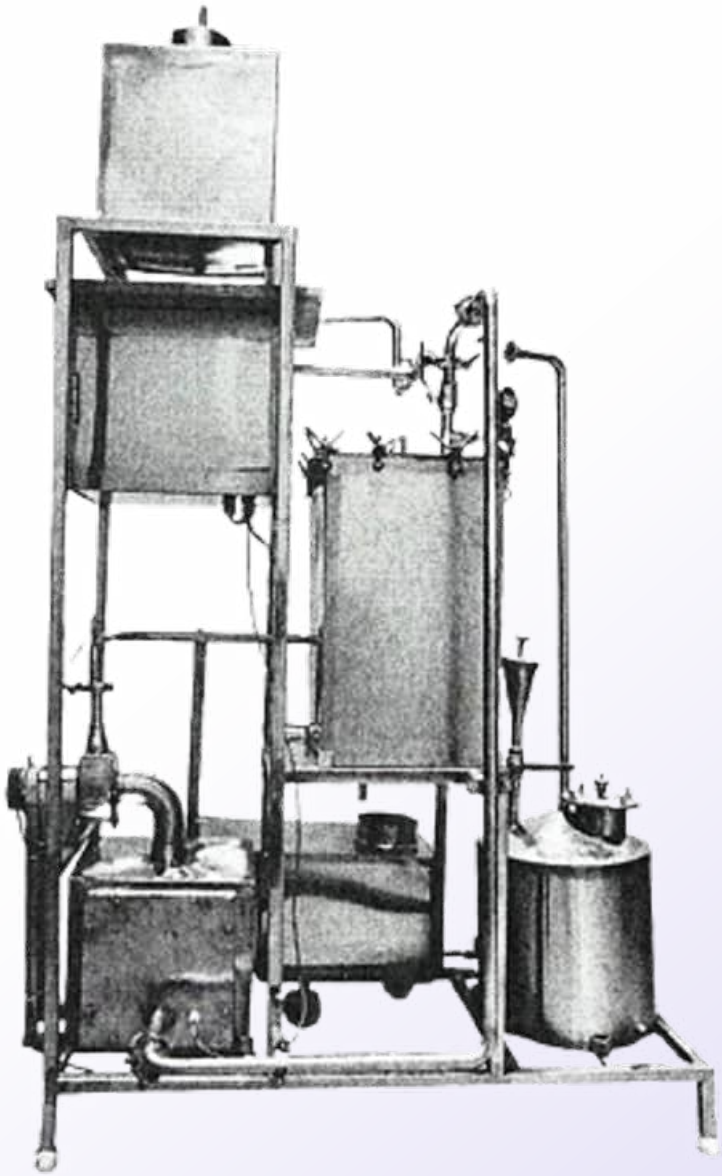
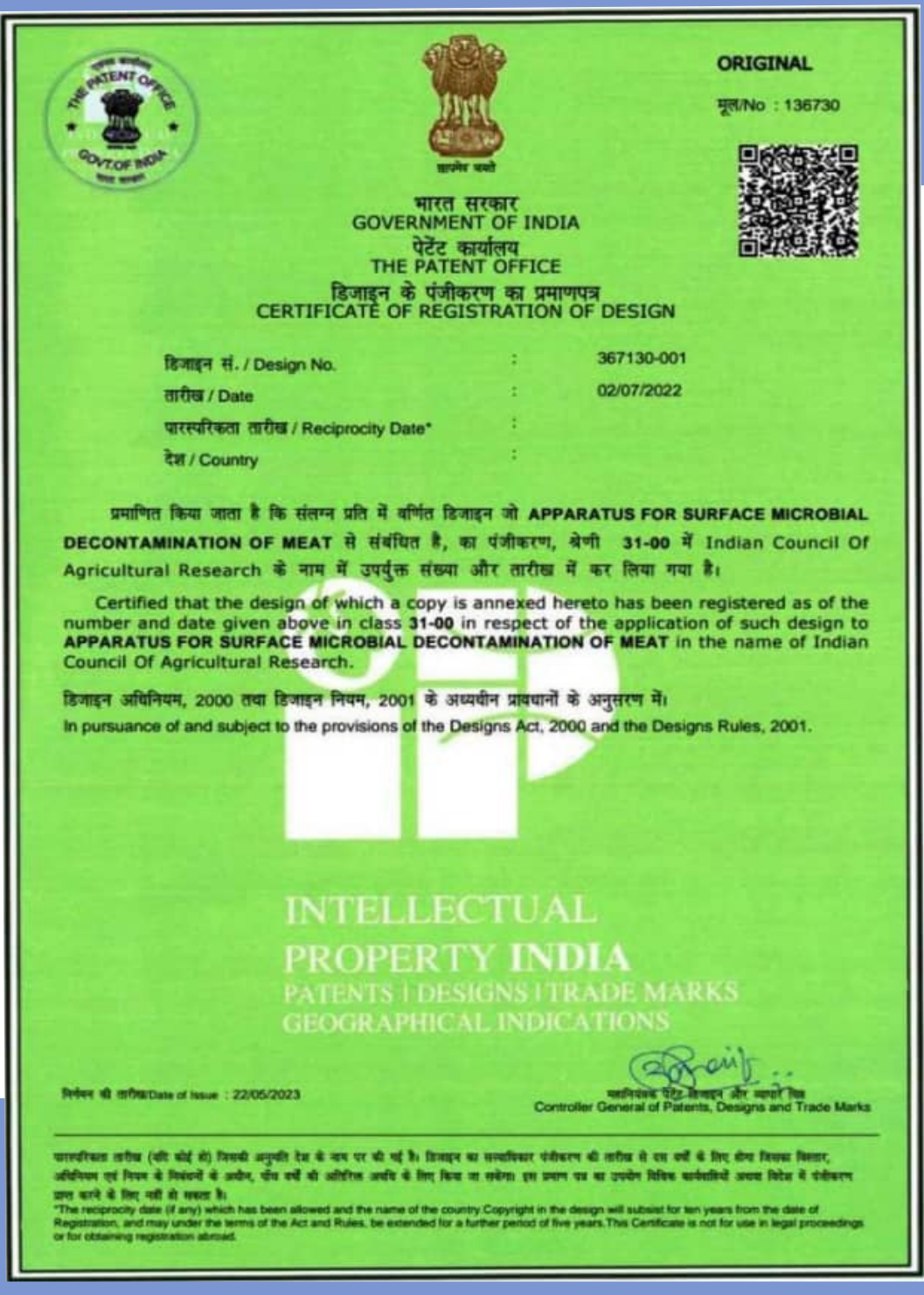


Fig. Apparatus for Surface Microbial Decontamination of Meat



ORIGINAL

मूल/No : 136730

सत्यमेव जयते

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GOVERNMENT OF INDIA
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डिजाइन के पंजीकरण का प्रमाणपत्र
CERTIFICATE OF REGISTRATION OF DESIGN

डिजाइन सं. / Design No.	:	367130-001
तारीख / Date	:	02/07/2022
पारस्परिकता तारीख / Reciprocity Date*	:	
देश / Country	:	

प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो **APPARATUS FOR SURFACE MICROBIAL DECONTAMINATION OF MEAT** से संबंधित है, का पंजीकरण, श्रेणी **31-00** में Indian Council Of Agricultural Research के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class **31-00** in respect of the application of such design to **APPARATUS FOR SURFACE MICROBIAL DECONTAMINATION OF MEAT** in the name of Indian Council Of Agricultural Research.

डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अध्यधीन प्रावधानों के अनुसरण में।
In pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

INTELLECTUAL
PROPERTY **INDIA**
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

निर्गमन की तारीख/Date of Issue : 22/05/2023

नियंत्रक महानियंत्रक पेटेंट, डिजाइन और व्यापार चिह्न
Controller General of Patents, Designs and Trade Marks

पारस्परिकता तारीख (यदि कोई हो) जिसकी अनुमति देश के नाम पर की गई है। डिजाइन का स्वामित्वकार पंजीकरण की तारीख से दस वर्षों के लिए सीमा विशेषाधिकार, अधिनियम एवं नियम के नियंत्रणों के अधीन, पांच वर्षों की अतिरिक्त अवधि के लिए विस्तार किया जा सकेगा। इस प्रमाण पत्र का उपयोग विधिक कार्यवाहियों अथवा विदेश में पंजीकरण प्राप्त करने के लिए नहीं हो सकता है।

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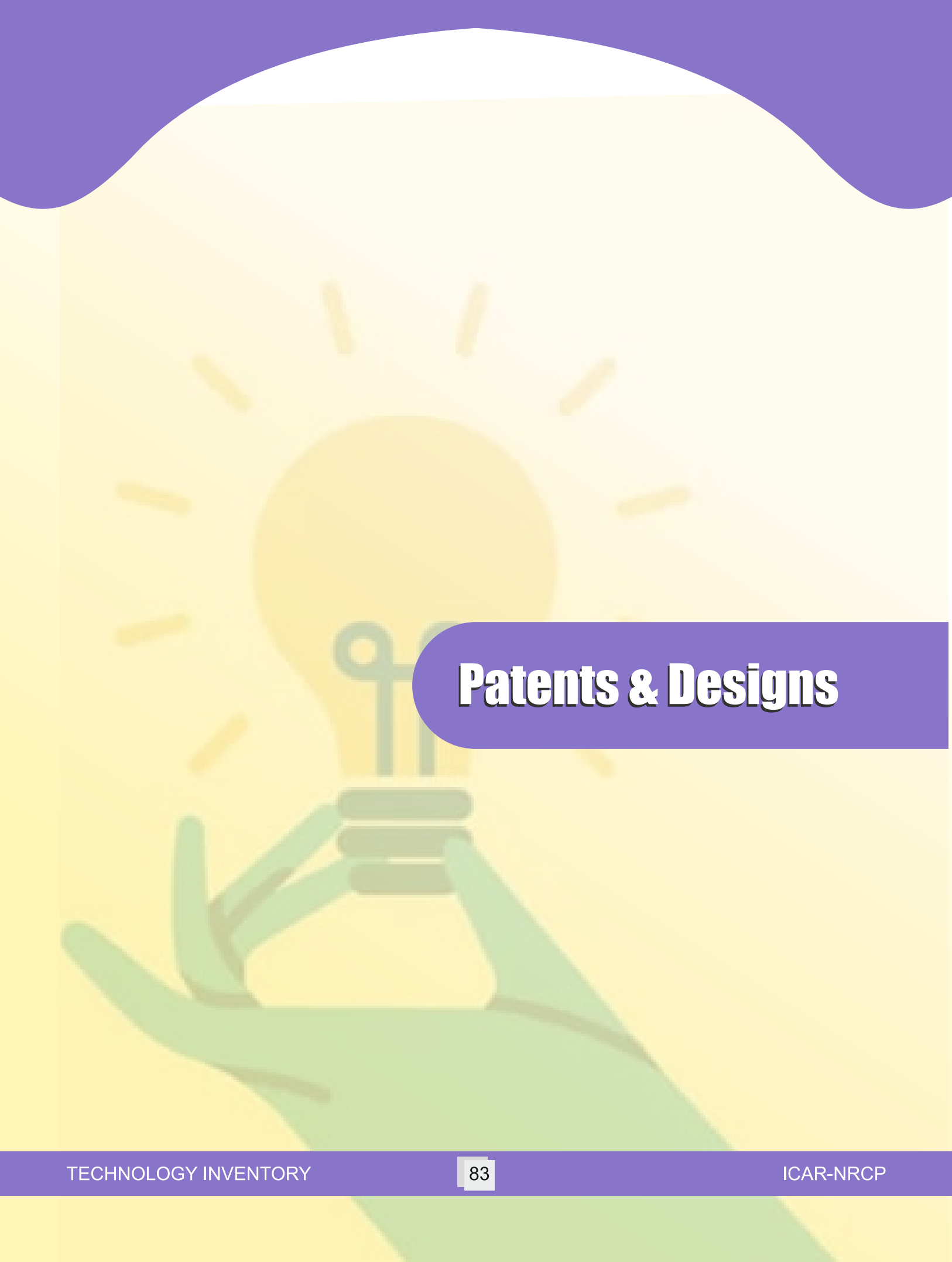


Patents & Designs

GRANTED PATENTS OF ICAR-NRC ON PIG

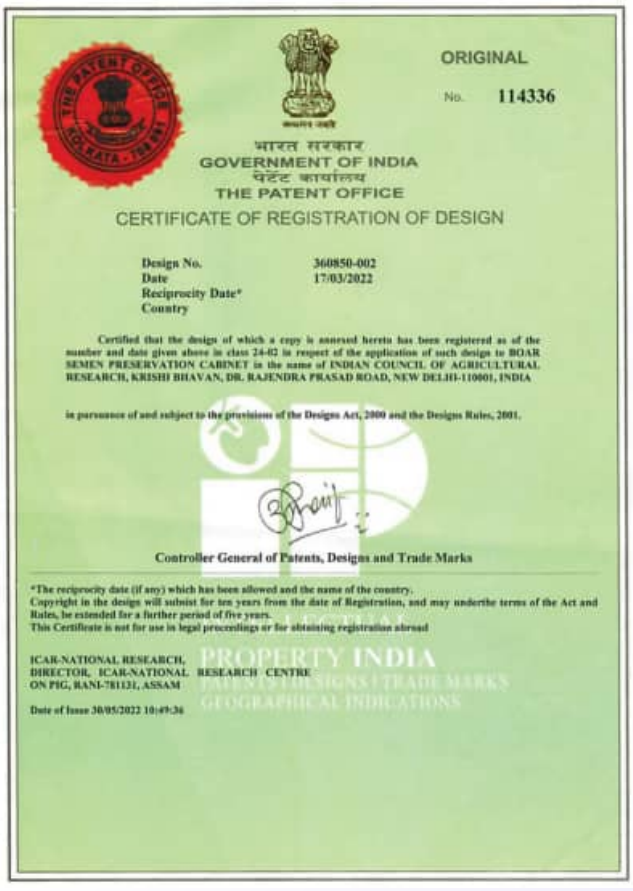
Sl.No	Name of the Patent	Grant No.	Grant Date	Ref. Page No.
1	A portable insulated container for hygienic transport of packaged meat	296345	27/04/2018	45
2	Corral apparatus and method for transport of animals	319634	31/08/2019	77
3	Pig hair fibre based biocomposite and a method for its preparation	354534	18/12/2020	73
4	Portable free standing small animal restraining tool	478346	07/12/2023	26
5	Pig restraining tool	505749	31/01/2024	28
6	Lamp primer system for rapid visual detection of streptococcus suis from pigs and application thereof	495923	08/01/2024	75






GRANTED DESIGNS OF ICAR NATIONAL RESEARCH

Sl.No	Name of the Patent	Design No.	Grant Date	Ref. Page No.
1	Boar semen preservation cabinet	360850-002	17/03/2022	62
2	Apparatus for surface microbial decontamination of meat	367130-001	02/07/2022	80
3	Boar semen preservation and transportation box	360850-001	13/03/2024	60



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No. 114336

भारत सरकार
GOVERNMENT OF INDIA
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THE PATENT OFFICE

CERTIFICATE OF REGISTRATION OF DESIGN

Design No. 360850-002
Date 17/03/2022
Reciprocity Date*
Country

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class 24-02 in respect of the application of such design to BOAR SEMEN PRESERVATION CABINET in the name of INDIAN COUNCIL OF AGRICULTURAL RESEARCH, KRISHI BHAVAN, DR. RAJENDRA PRASAD ROAD, NEW DELHI-110001, INDIA

in pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

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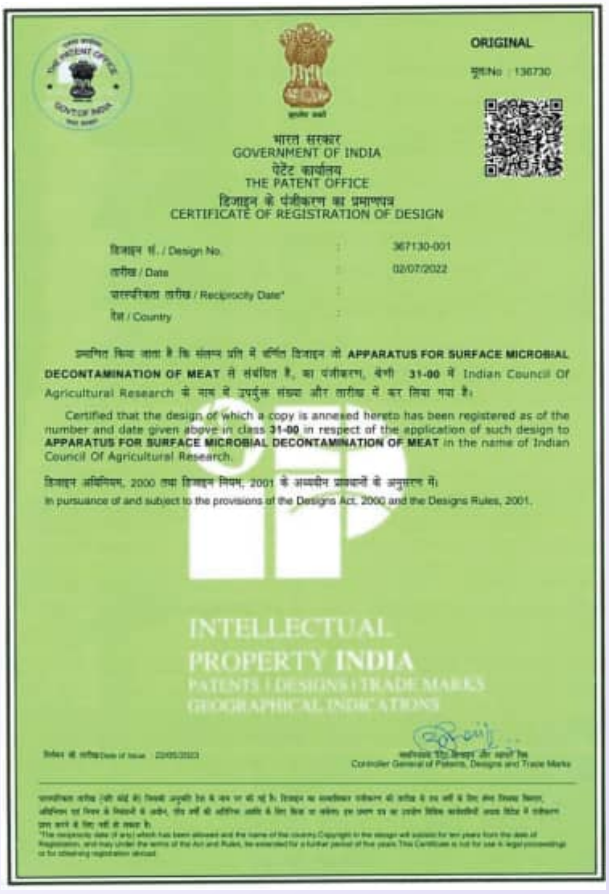
Date of Issue 30/05/2022 10:49:36



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पेटेंट कार्यालय
THE PATENT OFFICE
डिजाइन के पंजीकरण का प्रमाणपत्र
CERTIFICATE OF REGISTRATION OF DESIGN

डिजाइन सं. / Design No. : 367130-001
तारीख / Date : 02/07/2022
पारस्परिकता तारीख / Reciprocity Date* :
देश / Country :

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In pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

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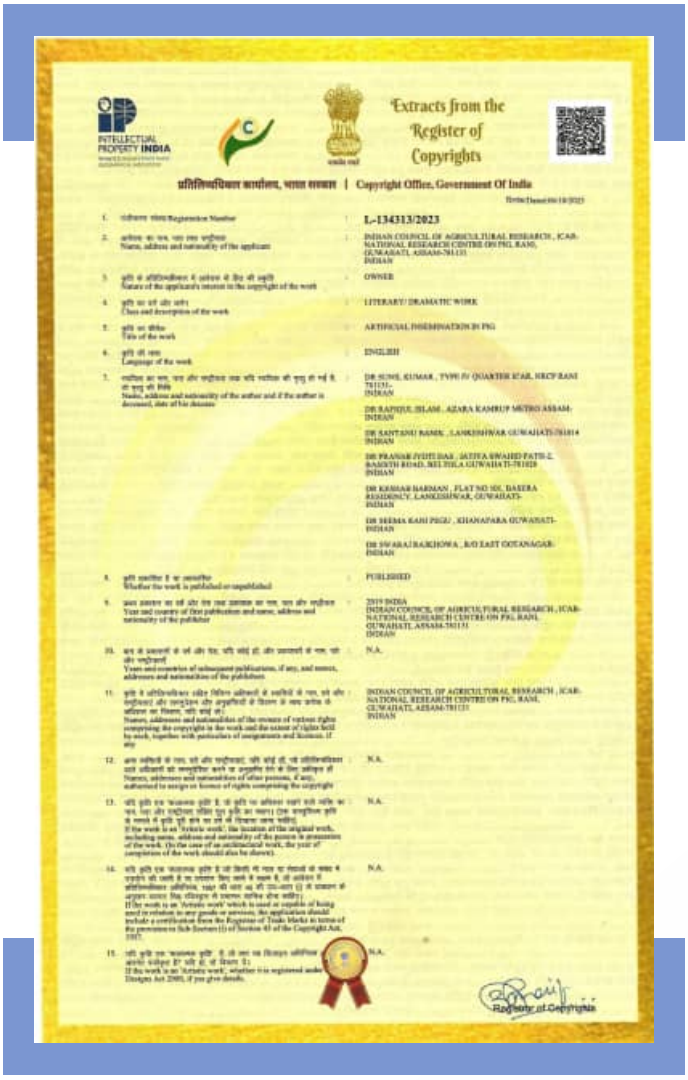
Artificial insemination in pig



Extracts from the Register of Copyrights

प्रतिलिप्यधिकार कार्यालय, भारत सरकार | Copyright Office, Government Of India

L-134313/2023

Registrar of Copyrights

Nucleofast viral DNA isolation kit

Extracts from the Register of Copyrights

प्रतिलिप्यधिकार कार्यालय, भारत सरकार | Copyright Office, Government Of India

L-135405/2023

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IGOAT recognition

Copyright Office
Government of India

सत्यमेव जयते

Extracts
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EPIG recognition

Piggyplex (D) ASF, PCV & PPV Assay kit

Extracts from the Register of Copyrights

प्रतिलिप्यधिकार कार्यालय, भारत सरकार | Copyright Office, Government Of India

L-135409/2023

LITERARY/ DRAMATIC WORK KIT LITERATURE

PIGGYPLEX (D) ASFV, PCV & PPV ASSAY KIT

ENGLISH

UNPUBLISHED

N.A.

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Extracts from the Register of Copyrights

प्रतिलिप्यधिकार कार्यालय, भारत सरकार | Copyright Office, Government Of India

L-142041/2024

LITERARY/ DRAMATIC WORK KIT LITERATURE

PIGGYPLEX(R) CSF, JE & PRRS ASSAY KIT

ENGLISH

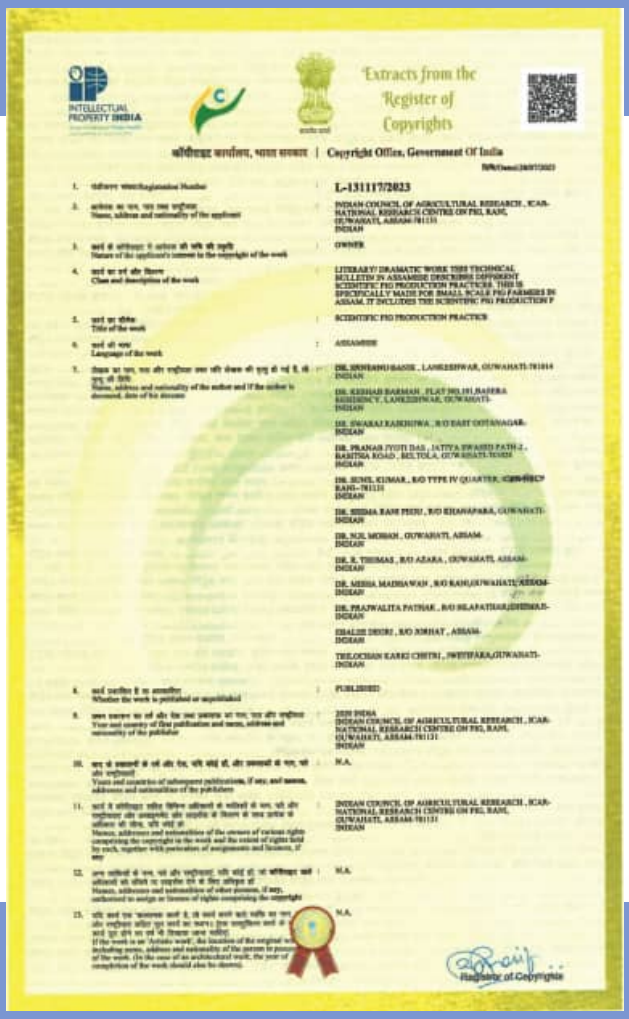
UNPUBLISHED

N.A.

Registrar of Copyrights

Piggyplex (R)CSF,JE & PRRS assay kit

Scientific pig production practices



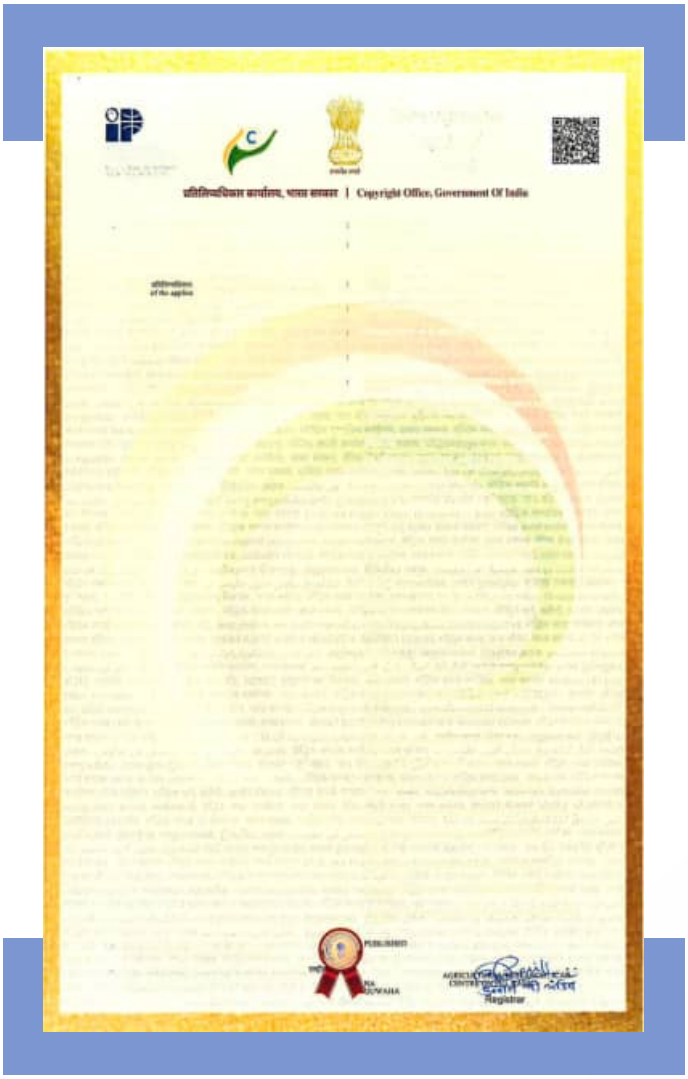
Extracts from the Register of Copyrights

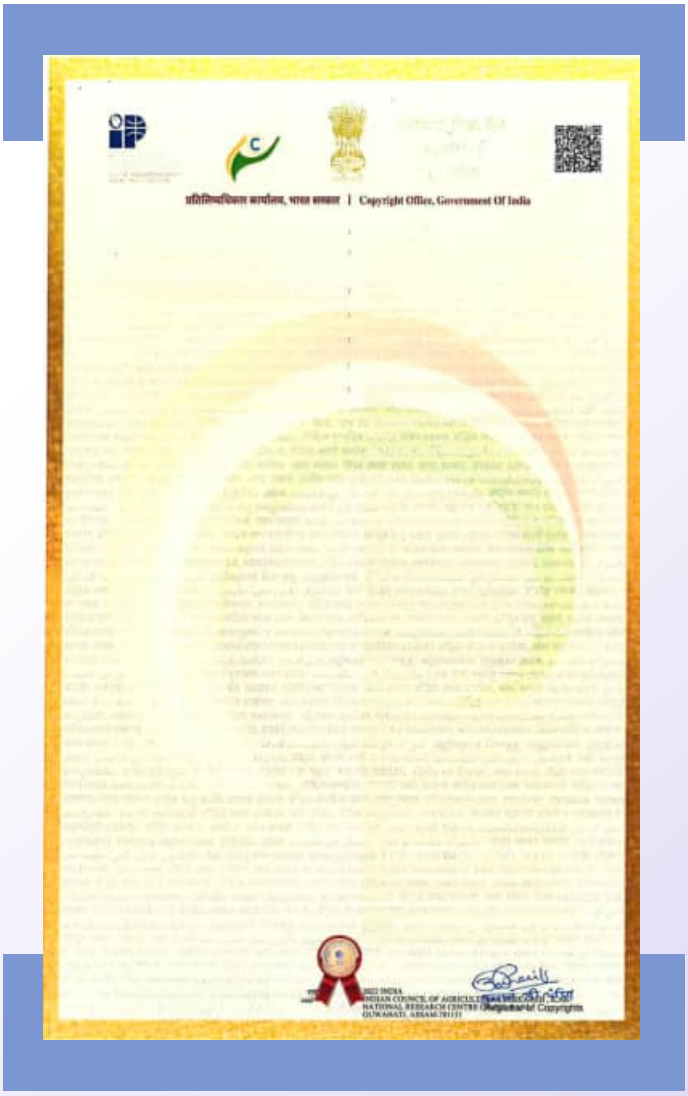
कॉपीराइट कार्यालय, भारत सरकार | Copyright Office, Government Of India

L-131117/2023

Gramin shukarpalan ke uthan hetu film

Biosecurity in scientific pig production





Joiw suraksha aru boigyanik poddhotire gahori palon

Trademarks

Nucleofast

प्रारूप आरजी - 2
Form RG - 2
क्रमांक No. 3302090

व्यापार चिन्ह रजिस्ट्री, भारत सरकार Trade Marks Registry, Government Of India
व्यापार चिन्ह अधिनियम, 1999 Trade Marks Act, 1999
व्यापार चिन्ह के रजिस्ट्रीकरण का प्रमाणपत्र | Certificate of Registration of Trade Mark
(धारा 23 (2), नियम 56 (1)) | Section 23 (2), Rule 56 (1)

व्यापार चिन्ह संख्या / Trade Mark No. : 5747847
दिनांक / Date : 02-01-2023
ज. संख्या / J. No. : 2109

प्रमाणित किया जाता है कि व्यापार चिन्ह / जिसका प्रतिरूप इसके साथ संलग्न है, वह
..... के नाम से ..... वर्ग में
..... संख्या के अधीन दिनांक ..... को
..... के संबंध में रजिस्ट्रीकृत किया गया है|

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In Class 10 Under No. 5747847 as of the date 02 January 2023 in respect of

Testing apparatus for medical purposes. Diagnostic apparatus for medical purposes.

NUCLEOFAST

आज वर्ष 20..... के ..... माह के ..... वे दिन को मेरे निर्देश पर मुद्रांकित किया गया
Sealed at my direction, this 10th day of November , 2023

व्यापार चिन्ह रजिस्ट्री मुंबई
Trade Marks Registry MUMBAI

व्यापार चिन्ह रजिस्ट्रार
Registrar of Trademarks

Registration is for 10 years from the date of application and may then be renewed for a period of 10 years and also at the expiration of each period of 10 years.
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व्यापार चिन्ह अधिनियम, 1999 Trade Marks Act, 1999
व्यापार चिन्ह के रजिस्ट्रीकरण का प्रमाणपत्र | Certificate of Registration of Trade Mark
(धारा 23 (2), नियम 56 (1)) | Section 23 (2), Rule 56 (1)

व्यापार चिन्ह संख्या / Trade Mark No. : 5747848
दिनांक / Date : 02-01-2023
ज. संख्या / J. No. : 2109

प्रमाणित किया जाता है कि व्यापार चिन्ह / जिसका प्रतिरूप इसके साथ संलग्न है, वह
..... के नाम से ..... वर्ग में
..... संख्या के अधीन दिनांक ..... को
..... के संबंध में रजिस्ट्रीकृत किया गया है|

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In Class 10 Under No. 5747848 as of the date 02 January 2023 in respect of

Testing apparatus for medical purposes. Diagnostic apparatus for medical purposes.

PIGGYPLEX (D)

आज वर्ष 20..... के ..... माह के ..... वे दिन को मेरे निर्देश पर मुद्रांकित किया गया
Sealed at my direction, this 10th day of November , 2023

व्यापार चिन्ह रजिस्ट्री मुंबई
Trade Marks Registry MUMBAI

व्यापार चिन्ह रजिस्ट्रार
Registrar of Trademarks

Registration is for 10 years from the date of application and may then be renewed for a period of 10 years and also at the expiration of each period of 10 years.
This certificate is not for use in legal proceedings or for obtaining Registration abroad.
Note: Upon any change of ownership of this Trademark, or change in address, of the principal place of business or address for service in India a request should AT ONCE be made to register the change.

Piggyplex (D)

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प्रारूप आरजी - 2
Form RG - 2
क्रमांक No. 3239789

व्यापार चिन्ह रजिस्ट्री, भारत सरकार Trade Marks Registry, Government Of India
व्यापार चिन्ह अधिनियम, 1999 Trade Marks Act, 1999
व्यापार चिन्ह के रजिस्ट्रीकरण का प्रमाणपत्र | Certificate of Registration of Trade Mark
(धारा 23 (2), नियम 56 (1)) | Section 23 (2), Rule 56 (1)

व्यापार चिन्ह संख्या / Trade Mark No. : 5535233
दिनांक / Date : 19-07-2022
अ. संख्या / J. No. : 2093

प्रमाणित किया जाता है कि व्यापार चिन्ह / जिसका प्रतिरूप इसके साथ संलग्न है, वह ..... के नाम से ..... वर्ग में ..... संख्या के अधीन दिनांक ..... को ..... के संबंध में रजिस्ट्रीकृत किया गया है|

Certified that Trade Mark / a representation is annexed hereto, has been registered in the name(s) of :- INDIAN COUNCIL OF AGRICULTURAL RESEARCH, ICAR-National Research Centre on Pig, Rani, Guwahati, Dist.-Kamrup, Assam, India, Pin-781131., An Indian Institute, (Government Department)

In Class 9 Under No. 5535233 as of the date 19 July 2022 in respect of

Computer software, computer programs, data processing equipment and computers.

Trade Mark as annexed

आज वर्ष 20..... के ..... माह के ..... वें दिन को मेरे निर्देश पर मुद्रांकित किया गया
Sealed at my direction, this 26th day of July , 2023

व्यापार चिन्ह रजिस्ट्री मुंबई
Trade Marks Registry MUMBAI

व्यापार चिन्ह रजिस्ट्रार
Registrar of Trademarks

Registration is for 10 years from the date of application and may then be renewed for a period of 10 years and also at the expiration of each period of 10 years.
This certificate is not for use in legal proceedings or for obtaining Registration abroad.
Note: Upon any change of ownership of this Trademark, or change in address, of the principal place of business or address for service in India a request should AT ONCE be made to register the change.

व्यापार चिन्ह के लिए अनुलग्नक / Annexure of Trade Mark Certificate

क्रमांक / No. 3239789

व्यापार चिन्ह संख्या / Trade Mark No. 5535233

दिनांक / Date 19-07-2022

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INTELLECTUAL PROPERTY INDIA
PATENTS DESIGNS TRADE MARKS GEOGRAPHICAL INDICATIONS

प्रारूप आरजी - 2
Form RG - 2
क्रमांक No. 3305191

व्यापार चिन्ह रजिस्ट्री, भारत सरकार Trade Marks Registry, Government Of India

व्यापार चिन्ह अधिनियम, 1999 Trade Marks Act, 1999

व्यापार चिन्ह के रजिस्ट्रीकरण का प्रमाणपत्र | Certificate of Registration of Trade Mark

(धारा 23 (2), नियम 56 (1)) | Section 23 (2), Rule 56 (1)

व्यापार चिन्ह संख्या / Trade Mark No. : 5747849
दिनांक / Date : 02-01-2023
ज. संख्या / J. No. : 2109

प्रमाणित किया जाता है कि व्यापार चिन्ह / जिसका प्रतिरूप इसके साथ संलग्न है, वह ..... के नाम से ..... वर्ग में ..... संख्या के अधीन दिनांक ..... को ..... के संबंध में रजिस्ट्रीकृत किया गया है|

Certified that Trade Mark / a representation is annexed hereto, has been registered in the name(s) of :- INDIAN COUNCIL OF AGRICULTURAL RESEARCH, ICAR-National Research Centre on Pig, Rani, Guwahati, Dist.-Kamrup, Assam, India, Pin-781131., An Indian Institute, (Government Department)

In Class 10 Under No. 5747849 as of the date 02 January 2023 in respect of

Testing apparatus for medical purposes. Diagnostic apparatus for medical purposes.

PIGGYPLEX (R)

आज वर्ष 20..... के ..... माह के ..... वें दिन को मेरे निर्देश पर मुद्रांकित किया गया

Sealed at my direction, this 12th day of November , 2023

व्यापार चिन्ह रजिस्ट्री मुंबई
Trade Marks Registry MUMBAI

व्यापार चिन्ह रजिस्ट्रार
Registrar of Trademarks

रजिस्ट्रीकरण आवेदन की तारीख से १० वर्ष के लिए है और तदोपरांत वह १० वर्ष की अवधि के लिए और प्रत्येक १० वर्ष की अवधि की समाप्ति पर भी नवीनीकृत किया जा सकेगा।
यह प्रमाणपत्र विधि कार्यवाहियों में प्रयोग के लिए या विदेश में रजिस्ट्रीकरण प्राप्त करने के लिए नहीं है
टिप्पणी : इस व्यापार चिन्ह के स्वामित्व में कोई परिवर्तन होने पर, या कारोबार के मुख्य स्थान के पते में या भारत में सेवा के लिए पते में परिवर्तन होने पर परिवर्तन को दर्ज करने के लिए एक बार अनुरोध किया जाना चाहिए.
Registration is for 10 years from the date of application and may then be renewed for a period of 10 years and also at the expiration of each period of 10 years.
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PHOTO GALLERY
ITMU ACTIVITIES

Technology Releases

Celebration of World Intellectual Property Day-2023

CAPACITY BUILDING

Youth Entrepreneurship Development Programme

Scientific and Technological exposure to the UG-PG Science students for Entrepreneurship development

INNOVIBE 2023 Youth Self-Reliant Seminar

Workshop on Sensitization of Institute Technologies

COLLABORATIONS

MoU with the SRS Meat and Fish Supplier Agartala Tripura

MoU with the Assam Down Town University

MoU with Indian Institute of Technology, Guwahati

MoU with Directorate of Veterinary and Animal Husbandry Services, Govt. of Manipur

TECHNOLOGY EXHIBITIONS

XVI Agriculture Science Congress and Agri Expo

North East Regional Food Festival 2023

North East Krishi Kumbha-2023

North East Livestock-Aqua-Poultry NELAP Exhibition & Conference 2023

भाकृअनुप
ICAR

RANI GUWAHATI ASSAM

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