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Contents

RESEARCH ARTICLES

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IMMUNOLOGIC ADJUVANT ACTIVITY OF NEEM LEAF EXTRACT IN RATS WITH SPLENECTOMY

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Abstract: Introduction: Immunologic adjuvants are substances of very varied chemical structure that are used to reinforce the immune response against an antigen administered simultaneously in immunization schemes when the antigen's immunogenicity is low. On the other hand, splenectomy is an intervention that consists in the total removal of the spleen with the intention of suppressing the immune response. So that, the aim of this work was to evaluate an immunosuppressant model of rats with splenectomy and the immunologic adjuvant activity of Neemaqueous leaf extract in that model. Material and methods: Cytotoxicity tests and phytochemical composition were performed on the extract to stablish the extract concentrations to be tested. Later, 16 rats were immunized in a 30-day immunization scheme with bovine serum albumin as an antigen, and three Neem-based adjuvants (10, 100 and 1000 µg/mL). Afterdoing the experiments, leukocytes were counted by manual method with Turk's liquid and Neubauer'schamber; and total proteinsin serum were quantified by Bradford method as an indicative of immunoglobulin production among experimental groups. Hepatic enzymes were analyzed by automated biochemical analysis. Results: The biotoxicity assay of the extract showed a 1077 µg/mL concentration as a LD50.A significant increase in leukocyte counts and protein concentration was observed between the beginning and end of the experiments. While the hepatic enzymes showed a normal profile. Conclusions: Neem aqueous leaf extract at concentration of 10 µg/mL exhibits immunologic adjuvant activity by enhancing leukocyte counts.

Keywords: Immunologic adjuvant, Neem, *Azadirachta* indica, Splenectomy, Leukocytes

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INTERCROPPING IN MUSTARD (*BRASSICA JUNCEA* L.) WITH CHICKPEA AND FIELD PEA

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Abstract: A field experiment was carried out during the winter (*rabi*) of 2019-20 at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar to study the effect of intercropping in mustard (*Brassica juncea* L.) nine treatment combination *viz.*, T_1 : Sole mustard, T_2 : Sole chickpea, T_3 : Sole field pea, T_4 : Mustard + chickpea (1:2), T_5 : Mustard + chickpea (1:3), T_6 : Mustard + chickpea (1:4), T_7 : Mustard + field pea (1:2), T_8 : Mustard + field pea (1:3) and T_9 : Mustard + field pea (1:4) were laid out in randomized block design replicated 3 times. Mustard + chickpea 1:3 ratio (T_5) recorded significantly higher number of primary and secondary

branches plant^{-1} and siliquae plant^{-1}. The sole crop of mustard (T_1) produced significantly the highest seed and stover yield in all the treatments. In mustard + chickpea/field pea intercropping system, the number of branches plant^{-1}, number of pods plant^{-1}, grain and straw yield was higher under sole chickpea (T_2)/ field pea (T_3). The higher LER (1.25) was recorded under mustard + chickpea 1:3 ratio intercropping system closely followed by mustard + chickpea 1:4 ratio of intercropping system. Significantly higher mustard equivalent yield was recorded under mustard + chickpea in 1:3 ratio (T_5), which remained at par with mustard + chickpea 1:4 (T_6) and mustard + chickpea 1:2 ratio (T_4). In case of intercropping treatments, mustard + chickpea in 1:3 row proportion recorded the maximum gross returns, net profit and benefit : cost ratio (BCR) of ` 1,31,273, ` 99,346 ha^{-1} and 4.11, respectively than rest of the treatments.

Keywords: Mustard, Chickpea, Field pea, Land equivalent ratio and Mustard equivalent yield

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SEED PRETREATMENT METHODS TO ENHANCE THE GERMINATION OF *MEMECYLON TALBOTIANUM* BRANDIS ENDEMIC TO THE WESTERN GHATS, A POTENTIAL SPECIES FOR CONSERVATION AND RESTORATION

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Abstract: *Memecylon talbotianum* is an understory evergreen tree endemic to Western Ghats. Propagation of *Memecylon* species is mainly through seeds, but the very poor and delayed germination of fresh seeds is a major hurdle in planting stock production. The present study was formulated to improve the germination of this species by imparting nine seed pretreatments. Results indicated the presence of physiological dormancy in this species which was evident from the permeable seed coat and presence of differentiated embryo. Soaking of depulped seeds in water for 12 hours was the best pretreatmentwith superior germination (41.1%), Mean Daily Germination (0.44) and Peak Value (0.56). Thissimple and cheap treatment can be recommended for large scale planting stock production of this species. This study forms the first report on germination attributes of *M. talbotianum* and the data will contribute to *ex situ* conservation of this endemic plant.

Keywords: Germination, Memecylon talbotianum, Physiological dormancy, Pretreatments, Water soaking

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INSECTICIDE RESISTANCE IN COTTON MEALYBUG, *PHENACOCCUS SOLENOPSIS* TINSLEY POPULATION COLLECTED FROM FARMER'S FIELD OF BHARUCH DISTRICT OF GUJARAT

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Abstract: Investigations on cotton mealybug, *Phenacoccus solenopsis* Tinsley" was carried out at Laboratory of Main Cotton Research Station, Navsari Agricultural University, Surat during October 2020 to January 2021 through the IRAC leaf dip bio-assay technique. Mealybug population from the farmers fields' of five locations *viz*., Amod, Bharuch, Jambusar, Netrang and Valia taluka of Bharuch district and as well as Research farm, MCRS, Surat were collected and reared at Main Cotton Research Station, NAU, Surat under field cage cover. Leaf dip bio-assays were carried out for the seven insecticides *viz*., imidacloprid 70 WG, acetamiprid 20 SP, thiamethoxam 25 WG, buprofezin 25 SC, lamda cyhalothrin 5 EC, spinosad 45 SC and profenophos 50 EC with eight concentrations including control with three repetitions. The LC_{50} values for imidacloprid 70 WG, acetamiprid 20 SP, thiamethoxam 25 WG, profenophos 50 EC, buprofezin 25 SC, Lamda cyhalothrin 5 EC and spinosad 45 SC ranged from 0.0027 to 0.0032, 0.0015 to 0.0017, 0.005 to 0.007, 0.025 to 0.049, 0.017 to 0.029, 0.004 to 0.011 and 0.009 to 0.022 per cent, respectively. The slope values across locations for specific insecticide were estimated as >1 indicated more near homogeneous population across locations. The LC_{90} values for imidacloprid 70 WG, acetamiprid 20 SP, thiamethoxam 25 WG, profenophos 50 EC, buprofezin 25 SC, lamda cyhalothrin 5 EC and spinosad 45 SC ranged from 0.023 to 0.033, 0.008 to 0.010, 0.048 to 0.058, 0.127 to 0.213, 0.072 to 0.126, 0.050 to 0.099 and 0.078 to

0.204 per cent, respectively. The relative resistance ratio considering lowest LC_{50} value as susceptible population varied from 1.00 to 1.19, 1.00 to 1.13, 1.00 to 1.40, 1.00 to 1.96, 1.00 to 1.71, 1.00 to 2.75 and 1.00 to 2.44 fold for imidacloprid 70 WG, acetamiprid 20 SP, thiamethoxam 25 WG, profenophos 50 EC, buprofezin 25 SC, lamda cyhalothrin 5 EC and spinosad 45 SC, respectively. The comparison between LC_{90} values obtained with the field recommended rate showed the lowest ratio for profenophos (1.27 to 2.13 fold), buprofezin (1.44 to 2.52 fold), acetamiprid (2.00 to 2.50 fold), spinosad (3.94 to 10.30 fold), imidacloprid (4.69 to 6.73 fold) and thiamethoxam (4.80 to 5.80 fold), whereas higher ratio for lamda cyhalothrin (10.00 to 19.80 fold). There was much variation between the LC_{90} and recommended rate in case of lamda cyhalothrin 5 EC at Valia (19.80 fold) followed by Amod (16.80 fold) than other locations (10.0 to 14.0 fold). Similarly, variation in case of spinosad 45 SC showed high at Netrang (10. 30 fold) followed by Bharuch (8.33 fold) than other locations (3.94 to 7.93 fold).

Keywords: Cotton, Farmers, Insecticide, Investigation, Population

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STUDIES ON CYTOLOGICAL CHARACTERIZATION OF *CISSUS QUADRANGULARIS* ECOTYPES FOR ASSESSMENT OF PLOIDY LEVEL

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Abstract: *Cissus quadrangularis*, commonly known as veldt grape, is one of the medicinally important perennial, climbing succulent, widely distributed in Africa, the Arabian Peninsula, Northern India, and Southeast Asia. The present investigation on cytological characterization of veldt grape was conducted at Department of Medicinal and Aromatics crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore from 2019 -2020. Fifty veldt grape ecotypes were collected from different geographical locations of Tamil Nadu and five morphologically superior ecotypes identified were subjected to ploidy level estimation bt using flow cytometry method. The mean FL1-H value varied from 1018.05 to 2896.2 for the five superior ecotypes selected. The highest mean value FL1-H were found in TNCq23 and the lowest mean value recorded in TNCq34 from the plot 4.CV value of the veldt ecotypes ranged from 217.38 (TNCq 23) to 334.00 (TNCq9). The histogram of the mean position of G1 phase of the selected veldt grape ecotypes using radish as the reference indicated that the mean position of G1 peak for all the five ecotypes (TNCq32, TNCq34, TNCq29, TNCq23 and TNCq9) exhibited diploid number (2n) of chromosomes.

Keywords: *Cissusquadrangularis*, Ecotypes, Ploidy level, Flow cytometry

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QUALITY EVALUATION OF THE TRADED RAW DRUG OF *TINOSPORA CORDIFOLIA* (CHITTAMRUTHU) COLLECTED FROM KERALA HERBAL MARKET

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Abstract: *Tinospora cordifolia* (Willd)Miers., is a herbaceous vine of the family Menispermaceae indigenous to tropical regions of the Indian subcontinent. Its uses and application with reference to human benefits have been written in various ayurvedic and vedic scriptures and practices long back. Its common names include Gilo, Moonseed, Chittamrithu etc. *Tinospora cordifolia* is used for diabetes, high cholesterol, allergic rhinitis (hay fever), upset stomach, gout, lymphoma and other cancers, rheumatoid arthritis , hepatitis, peptic ulcer disease , fever, gonorrhea, syphilis, and finally to boost the immune system. It is one of the ingredients of KHADA preparation recommended by Ministry of Ayush for boosting up immunity during Covid -19 pandemic. The rising demand for this drug now has naturally may lead to adulteration inmarket raw drug samples. This paper presents the results of quality evaluation of the raw drug market samples of *Tinospora*

cordifolia collected from different herbal markets of Kerala. In the study the thin layer chromatographic profiles of the genuine plant samples were compared withthat of market samples. The TLC profile of the methanol extract of genuine plant material gave specific fingerprint which can be differentiated from spurious samples by cross matching. This method can be effectively utilized for checking of the market samples for ensuring the quality. Thestudy revealed that out of fifty market samples analysed only forty seven were pure and three werespurious.

Keywords: Adulteration, Tinospora, Chittamruthu, Thin layer chromatography (TLC)

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STUDIES ON MANAGEMENT OF POSTHARVEST FRUIT DROP OF KINNOW THROUGH INTEGRATED APPROACHES

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Abstract: Kinnow is an important citrus fruit grown in India. Post harvest diseases account for 50% of losses in fruits stored under poor storage conditions especially under high humidity. They pose a major problem to the agriculture industry. Not only the quality and quantity are affected by the post harvest losses but losses in fruits can occur in terms of economics, quantity, quality and nutrition. Among the various pathological constraints, postharvest fruit drop is a most serious problem for citrus growers. The two most common pathogens that are responsible for post harvest fruit drop of citrus fruits are *Penicillium digitatum* (green mould) and *Penicillium italicum* (blue mould). Different bioagent, chemicals and botanicals evaluated under *in vitro* condition against the mycelial growth of *Penicillium digitatum* and *Penicillium italicum*. All botanicals, BCAs and chemicals inhibited the growth (colony diameter) of both pathogens over untreated PDA plates, but the maximum inhibition was exhibited by *B. subtilis* followed by garlic. Results indicated that BCAs and botanicals have the potential to control Postharvest diseases without causing any injury or harmful effects on Kinnow mandarin; these can be recommended as a safe method for extending its storage life while maintaining fruit quality at the same time.

Keywords: Botanical control, Fruit drop, Postharvest pathogens, Integrated disease management

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STUDY THE EGG LAYING PREFERENCE ON DIFFERENT DEVICES FOR TASAR SILKWORM *ANTHERAEA MYLITTA* DRURY (LEPIDOPTERA: SATURNIIDAE) SEED PRODUCTION

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Abstract: Tasar silkworm *A. mylitta* was evaluated with different egg laying devices at Janjgir, Chhattisgarh for better seed production of tasar grainagers. Earthen cup was recorded maximum number of laid eggs (241) and first day highest hatching (45 per cent). The second day maximum hatching (43 per cent) was recorded in paper cup and the third day highest hatching (31 per cent) was recorded in plastic box but nylon net bag was found superior in case of maximum total hatching (90 per

cent) with least unlaid eggs (17.20) and highest coefficient of egg laying (93.04 per cent). The time taken for harvesting of eggs was minimum (21.33 second) in case of wax coated paper cup. Among all the devices, nylon net bag was the most cost effective and durable device for egg laying.

Keywords: Oviposition, Laid eggs, Unlaid eggs, Egg laying devices, Hatching, *Antheraea mylitta*

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POSTHARVEST PHYSIOLOGY OF INDIAN JUJUBE FRUIT UNDER DIFFERENT STORAGE TEMPERATURE

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Abstract: Indian ber cv. 'Gola' was harvested at color turning stage and stored at control, 15°C and 10 °C for 35 days of storage. Analytical determination was made at 7 d interval. Storage temperatures were found effective to inhibiting ethylene production and maintain lower physiological activities during storage, especially when stored at 10 °C. Weight loss, firmness, chilling incidence and ripening index were significantly reduced by lower storage temperature. Overall, this study suggested that lower temperature could increase storage period of Indian ber fruit with optimum quality parameters and lowest chilling incidence.

Keywords: Ethylene production, Indian jujube, Respiration rate, Ripening index

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IPOMOEA PARASITICA (KUNTH.) G. DON – A NEW DISTRIBUTIONAL RECORD FOR MADHYA PRADESH, INDIA

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Abstract: During a recent field visit to Yawal wildlife sanctuary authors collected an interesting and novel plant specimen from Sirwel Dist. Khargone (Madhya Pradesh). The identification and authentication have been done with the standard literature i.e.,different floras, research papers *etc.* and it isidentified as *Ipomoea parasitica* (Kunth.) G. Don. It is a new world species and is collected for the first time in Madhya Pradesh and as per our knowledge, it is notcollected and recorded from Madhya Pradeshso far.Hence, the present collection of *Ipomoea parasitica*(Kunth.) G. Don, forms a new distributional record for Central India. The voucher specimen of the collection has been deposited at the BARO Herbarium Department of Botany, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat.

Keywords: Central India, Convolvulaceae, Ipomoea, New distribution

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INFLUENCE OF SHADE, INORGANIC AND ORGANIC AMENDMENTS ON BIOCHEMICAL AND QUALITY ASPECTS OF TURMERIC (*CURCUMA LONGA* L.)

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Abstract: The present investigation was carried out at the College Orchard, Department of Spices and Plantation Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The experiment was laid out in split plot design consisting of two main plots, namely open and shade and the sub plot treatments consisted of different doses of inorganic fertilizers, organic manures, biofertilizers and growth stimulants constituting to about 40 different treatment combinations. The biochemical parameters and quality attributes were studied and analyzed after harvest. Among the biochemical parameters at 180 DAP, the treatment M_2S_8 (shade + 100 per cent NPK + 50 per cent FYM (15 t ha^{-1}) + coir compost (10 t ha^{-1}) + *Azospirillum* (10 kg ha^{-1}) + phosphobacteria (10 kg ha^{-1}) + 3 per cent panchakavya) expressed increased total chlorophyll content (1.953 mg g^{-1}) and total phenol (129.85 µg g^{-1}) content. Likewise, M_1S_8 (open + 100 per cent NPK + 50 per cent FYM (15 t ha^{-1}) + coir compost (10 t ha^{-1}) + *Azospirillum* (10 kg ha^{-1}) + phosphobacteria (10 kg ha^{-1}) + 3 per cent panchakavya) exhibited highest soluble protein (88.88 mg g^{-1}) and IAA oxidase (999.8 µg of IAA oxidized g^{-1} $hr^{-1)}$ contents. The treatment M_2S_{18} (shade + 50 per cent FYM + coir compost + *Azospirillum* (10 kg ha^{-1}) + phosphobacteria (10 kg ha^{-1}) + 3 per cent panchakavya) exhibited the highest curcumin content (5.570 per cent), oleoresin (10.22 per cent) and essential oil content (5.68 per cent) content.

Keywords: Turmeric- shade- organic amendments, Biofertilizers, Biochemical and quality parameters