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# Physical Sciences

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## Characterization of Lipids in *Rhynchophorus pheonicis* Larval Oil

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(received October 14, 2004; revised April 14, 2007; accepted April 16, 2007)

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**Abstract.** *Rhynchophorus pheonicis* larval oil was extracted, and characterized by physical and chemical methods. The lipid content of the larva was  $25.30 \pm 0.20\%$  (wet weight). The oil was golden-yellow, odourless and fluid at room temperature ( $26 \pm 2$  °C). Lipid analysis revealed that the larval oil comprised of  $88.40 \pm 0.35\%$  neutral lipid,  $8.20 \pm 0.11\%$  phospholipid and  $2.60 \pm 0.10\%$  glycolipids. The unsaturated fatty acids accounted for 61.10 % of the total fatty acids whereas, the saturated fatty acids constituted 38.90% of the fatty acids. Further analysis revealed refractive index of  $1.30 \pm 0.05$ , specific gravity of  $0.89 \pm 0.01$ , solidification value of 12-14 °C, total lipid phosphorus of  $31.00 \pm 0.25$  ( $\mu\text{g/g}$  lipid), acid value of  $3.50 \pm 0.06$ , iodine value of  $123.60 \pm 0.24$ , saponification value of  $198.90 \pm 0.25$ , and unsaponifiable matter of  $8.60 \pm 0.18$ . These values when compared with that observed in oils which have been considered to be of high quality, and of much use in the pharmaceutical industries, suggested that *R. pheonicis* larval oil may have pharmaceutical potential.

**Keywords:** *Rhynchophorus pheonicis*, lipids, physical characteristics, chemical characteristics

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# Synthesis and Biological Activity of 7-Benzyloxy and 7-Methoxy Flavone

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**Abstract.** Benzyl and methyl derivatives of 7-hydroxyflavone were synthesized from 2-hydroxy-4-benzyloxy-acetophenone and 2-hydroxy-4-methoxyacetophenone, respectively, via chalcone precursor and by the treatment with DMSO/I<sub>2</sub>, diphenyl sulphide and dichloro dicyano quinone (DDQ). The antibacterial and antifungal activity of these flavones and their corresponding chalcones were found *in vitro* by the filter paper disc diffusion method and poisoned food technique.

**Keywords:** 7-hydroxyflavone, derivatives, antibacterial and antifungal activity

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# Arsenic Linkage in the Irrigation Water-Soil-Rice Plant Systems

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(received July 26, 2005; revised March 3, 2007; accepted April 7, 2007)

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**Abstract.** This investigation reports the levels of arsenic (As) in irrigation waters, soils and Boro (dry season) rice grain from 100 shallow tube well (STW) areas over the sadar upazila of Chapai Nawabganj. The As concentrations for all samples (soil, water and rice grain) varied widely between locations. The shallow tube well (STW) water As concentration ranged from 0.015-0.352  $\mu\text{g/ml}$  with a mean of 0.075  $\mu\text{g/ml}$ , the concentration being lower in shallow well depth, reaching to a maximum about at 25 m depth and then decreased with increasing depths. The levels of total As in soils over the locations ranged from 5.8-17.7  $\mu\text{g/g}$  with a mean of 11.2  $\mu\text{g/g}$ . Total As content in soils was positively correlated with irrigation water-As indicating a possibility of As build up in soil with time. The rice grain-As concentration was in the range of 0.24-1.30  $\mu\text{g/g}$  having a mean of 0.76  $\mu\text{g/g}$ . 22% of the grain samples had As level  $<0.5 \mu\text{g/g}$ , 39% in the range of 0.50-0.75  $\mu\text{g/g}$ , 36% in the range of 0.75-1.0  $\mu\text{g/g}$  and the rest 12% more than 1.0  $\mu\text{g/g}$ . The grain-As was poorly correlated with soil-As as well as irrigation water-As. 94% of the rice grain grown in Chapai Nawabganj irrigated with As contaminated water may lead to an intake of more than 100% maximum tolerable daily intake (MTDI) for an adult of 60 kg body weight.

**Keywords:** arsenic, shallow tube well water, soil, rice grain, rice straw

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## Removal of the Herbicide Molinate by Drinking Water Treatment Processes

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(received March 20, 2006; revised March 14, 2007; accepted March 31, 2007)

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**Abstract.** The removal of molinate efficiency as an organic contaminant was evaluated by applying drinking water treatment processes. Water treatment processes viz., chlorination, ozonation and activated carbon treatment were applied separately to water system. The level of molinate in water reduced to 33% when it was treated with sodium hypochlorite. In water system, 47 and 73% of this herbicide was dissipated by treatments of ozone and ozone combined with hydrogen peroxide, respectively. Powdered activated carbon (PAC) exhibited a better performance for the removal of molinate as compared to granular activated carbon (GAC) and activated carbon removed this herbicide effectively. The association of ozonation with sodium hypochlorite and activated carbon treatments were considered to be the best-tested treatment for the removal of molinate from water. Therefore, if molinate enters water as an organic contaminant, it could be removed effectively by drinking water treatment processes.

**Keywords:** herbicide molinate, drinking water, chlorination, activated carbon, ozonation

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## Pollution Profile of Malir River

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(received November 22, 2004; revised January 1, 2007; accepted January 20, 2007)

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**Abstract.** This study was aimed at determining the physical (pH, TDS, TSS) and chemical (ammonia, BOD<sub>5</sub>, COD, chloride, cyanide, detergents, phenols and sulphate) parameters as well as heavy metals (As, Cd, Cu, Cr, Pb, Ni, and Zn) present in Malir river water, so as to identify the extent of pollution. The average results of each parameter of 10 different sites were compared with National Environmental Quality Standards (NEQS). It was found that Malir river water quality meets only some of the NEQS. Variable quantities of different heavy metals were also found. It can be concluded that the continuous discharge of Malir river at Gizri creek plays an important role resulting in reduced biodiversity.

**Keywords:** Malir river, effluent, pollution, industrial, water quality

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## Short Communication

# Claisen Rearrangement of 2'-Hydroxy-4-Methyl-4'-Prenyloxychalcone

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(received September 9, 2004; revised February 26, 2007; accepted March 29, 2007)

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**Abstract.** Claisen rearrangement of 2'-hydroxy-4-methyl-4'-prenyloxychalcone (**2**) using acetic anhydride in dimethylaniline yields four major compounds viz. 2'-hydroxy-4-methyl-4'', 4'', 5''-trimethyldihydrofurano (2'', 3'': 4', 3')chalcone (**3**), 2',4'-diacetoxy-4-methyl-3'-( $\alpha$ ,  $\alpha$ -dimethylallyl)chalcone (**4**), 2',4'-diacetoxy-4-methyl-5'-( $\alpha$ ,  $\alpha$ -dimethylallyl)chalcone (**5**), 2',4'-diacetoxy-4-methylchalcone (**6**) and several other minor compounds. All the isolated products were identified on the basis of IR, UV, <sup>1</sup>H-NMR, Mass and Elemental analysis.

**Keywords:** chalcone, claisen rearrangement, chalcone derivatives

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# Biological Sciences

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## Nutritional Composition and Antimicrobial Activity of Fractionated Extracts of *Garcinia kola* Heckel

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(received June 13, 2006; revised December 16, 2006; accepted April 12, 2007)

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**Abstract.** Seeds of *Garcinia kola* were analysed for mineral and amino acid composition. Solvent extraction and fractionation of bioactive components of the seeds were accomplished using Soxhlet extractor and vacuum liquid chromatography, respectively. Fractionated extracts were assessed for sensory and antimicrobial activities. The seed contained varying amounts of micro nutrients with low amounts of anti-nutritional elements. Amino acids found at considerable quantities in the seed of *Garcinia kola* were essential amino acids like L-lysine, L-histidine, L-arginine, L-valine, L-methionine, L-isoleucine, L-leucine and L-phenyl alanine. Fractionation of the dark brown - bitter crude extract yielded some fractions (F<sub>4</sub>, F<sub>5</sub>) that were yellow in colour with non-bitter taste. The fractionated extracts exhibited antimicrobial activities. The most potent fraction (F<sub>4</sub>) had minimum inhibitory concentrations of 1 µg/ml on each of the organisms, *Bacillus cereus*, *Streptococcus faecalis*, *Candida albicans* and minimum inhibitory concentrations (µg/ml) of 0.125, 0.5, 2 on *Escherichia coli*, *Klebsiella pneumoniae* and *Staphylococcus aureus*, respectively. The fractionated extracts can be exploited to preserve food systems from undesirable activities of microorganisms.

**Keywords:** *Garcinia kola* seeds, nutrients, fractionated extracts, sensory attributes, microbial inhibition

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## Nutritional Evaluation, Functional Properties and Anti-Nutritional Factors of *Macrobrachium rosenbergii*, an Underutilized Animal

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(received October 16, 2006; revised February 16, 2007; accepted April 3, 2007)

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**Abstract.** The proximate, nutritionally valuable minerals, functional and anti-nutritional factors of *Macrobrachium rosenbergii* were determined in the laboratory for human consumption. Results indicated a high protein content ( $68.88 \pm 0.56\%$ ), ash ( $15.33 \pm 0.14\%$ ), moisture ( $9.37 \pm 0.03\%$ ), fat ( $5.36 \pm 0.01\%$ ) and carbohydrate ( $1.06 \pm 0.00\%$ ), while fibre was not detected. Protein solubility was pH dependent with minimum and maximum protein solubilities at pH 2, pH 6 and pH 11. Nutritionally valuable mineral analyses showed that *M. rosenbergii* contains phosphorus ( $126.18 \pm 0.032$  mg/100 g), magnesium ( $86.44 \pm 0.10$  mg/100 g), potassium ( $64.24 \pm 0.20$  mg/100 g), sodium ( $57.53 \pm 0.15$  mg/100 g), calcium ( $49.54 \pm 0.11$  mg/100 g), iron ( $7.20 \pm 0.02$  mg/100 g), manganese ( $0.89 \pm 0.01$  mg/100 g) and zinc ( $0.69 \pm 0.01$  mg/100 g). Copper, cobalt, lead, nickel and chromium were not detected. The sample had a minimum gelation concentration of ( $8.5 \pm 0.10\%$ ), water absorption capacity ( $345.00 \pm 0.30\%$ ), oil absorption capacity ( $521.36 \pm 0.12\%$ ), foaming capacity ( $15.00 \pm 0.05\%$ ), foaming stability ( $2.20 \pm 0.01\%$ ), emulsion capacity ( $22.62 \pm 0.03\%$ ) and emulsion stability ( $45.50 \pm 0.15$ ). Three anti-nutrients were determined: phytic acid was  $4.00 \pm 0.01$  mg/100 g, oxalate  $1.05 \pm 0.00$  mg/100 g while tannin was not detected.

**Keywords:** *M. rosenbergii*, protein solubility, functional properties, anti-nutrients, proximate composition

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# Pharmacological and Clinical Evaluation of Herbal Formulation for the Treatment of Various Hair/Scalp Problems

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**Abstract.** The study was conducted on a product based on herbal formulation of nine herbs in sesamum oil base supplemented with four essential oils and vitamin E. Clinical study was conducted on 175 human volunteers suffering from different kinds of hair and scalp problems. After clinical trials of 2-10 weeks, this formulation was found very effective in problems like head pustules, dryness and brittleness of hair, dandruff, itching, split hair, excessive hair fall and poor hair growth. In addition, it was also effective in cases of headache and sleeplessness. It was evaluated pharmacologically by acute oral toxicity test, dermal irritant test, eye irritation test and found safe and non toxic. Moreover, it did not cause any side effect.

**Keywords:** herbal formulation, hair/scalp problems, pharmacological evaluation, clinical trials

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## Inhibitory Activity of Ogi on *Salmonella typhi*

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(received May 26, 2005; revised March 29, 2007; accepted April 4, 2007)

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**Abstract.** The survival of two strains of *Salmonella typhi*, ATCC 14028 and SSH 41, were investigated in one uncooked and two cooked (one maintained at  $\geq 25^{\circ}\text{C}$ , and second maintained at  $\leq 35^{\circ}\text{C}$ ) samples of Ogi, a fermented cereal porridge. Ogi was obtained by fermentation of maize for five days. The foods were inoculated with a known concentration of the cell suspension of the test organisms which showed a sharp decrease in their numbers after 5 h. The antibacterial effect of uncooked Ogi was more pronounced on the two strains of *Salmonella typhi* ATCC 14028 and *Salmonella typhi* SSH 41, with  $4.57 \times 10^3$  cfu/h and  $2.20 \times 10^3$  cfu/h decline in growth rate respectively within 5 h. *Staphylococcus* sp., *Aspergillus* sp., *Fusarium* sp., *Epholsporium* sp., *Pediococcus* sp., *Leuconostoc* sp., *Lactobacillus* sp., *Corynebacterium* sp., *Saccharomyces cerevisiae*, *Alkaligenes* sp., and *Candida mycoderma* were isolated from the fresh and fermented maize at different times of fermentation. It is interesting to note that the fermenting organisms depended much on calcium (67%) and sodium (30%) for their growth.

**Keywords:** Ogi, inhibition, *Salmonella typhi*

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## Antibacterial Property of *Aloe vera* Plant Extract

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(received May 8, 2006; revised April 6, 2007; accepted April 10, 2007)

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**Abstract.** The antibacterial activity of *Aloe vera* (*barbadensis* Miller) was investigated on some test organisms using the agar diffusion and tube dilution methods. Ethanol, hot water and distilled water were the solvents used for extraction of the active ingredients from the plant leaf. The test organisms used were *Streptococcus pyogenes*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Bacillus* sp., *Klebsiella* sp., and *Escherichia coli*. The results showed that *Aloe vera* ethanolic extract had more antibacterial activity than the hot water and distilled water extracts producing the largest zone of inhibition (22 mm) on *S. aureus*. The results also showed that all the organisms tested were susceptible to the extracts except *E. coli*, which was resistant to the cold distilled water extract. For susceptible strains, the diameter of zones of inhibition ranged from 9 mm - 22 mm. The results of the susceptibility tests showed that the *A. vera* plant extracts compared favourably with tested commercial antibiotics. The minimum inhibitory concentration (MIC) results revealed that the plant extracts had low MIC values, ranging from 0.15625-0.625 µg/ml.

**Keywords:** *Aloe vera*, extract, antibacterial property

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# Identification of Plant Traits for Characterization of Early Maturing Upland Cotton Varieties

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**Abstract.** Thirteen upland cotton varieties with morphologically distinguished plant traits were evaluated so, as to characterize early maturing cotton. According to ANOVA test, the varieties differed significantly for all the traits studied. The varieties, in days taken to set first flower varied from 41.0 to 48.0; sympodial branch node numbers 5.5 to 9.0; 1<sup>st</sup> effective boll setting branch number 6.3 to 10.3; sympodial branch length 14.2 to 35.7 cm; boll opening 53.0 to 81.0%; boll weight 2.7 to 4.5 g, and seed cotton yield 126.0 to 196.3 g. It was observed that most of the plant traits simultaneously favoured the varieties in their characterization for earliness. Thus as compared to late maturing varieties, early varieties took minimum of 41.0 days to set first flower, produced lower sympodial branches at 5.5 to 6.5<sup>th</sup> nodes; set first effective boll at 6.3 to 7.5<sup>th</sup> nodes; produced shorter sympodial branches of 14.2 to 21.6 cm; opened 75.0 to 81.0% of bolls at 120 days after planting, gave medium bolls of 3.0 to 3.5 g. According to short season's classification, the varieties which opened 75 to 81% of their bolls were if picked after 145 days, the boll opening percent may have reached about 95%. Thus such varieties could be considered as early maturing ones. In present studies, varieties CIM-511, CIM-506, NIAB-999, BH-147, CRIS-467, CRIS-168 and CRIS-342 can be characterized as early maturing cotton. Significant correlation coefficient ( $r$ ) values between earliness plant traits further suggested that selection of one trait for earliness can indirectly but simultaneously improve another trait related to earliness.

**Keywords:** morphological plant traits, early maturity, upland cotton varieties

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## Yield and Quality of *Brassica* Cultivars as Affected by Soil Salinity

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**Abstract.** A field study was conducted at two different salt-affected locations (1) district Hafizabad having electrical conductivity of soil extract (ECe) = 6.46 dS/m and sodium absorption ratio (SAR) = 7.22 and (2) district Sargodha (ECe = 13.02 dS/m; SAR = 12.70) to test the yield response and quality of five brassica cultivars. The cultivars viz. sultan raya, BRS-II, rainbow, shiralle and dunkled were selected after preliminary screening against NaCl salt stress under hydroponic conditions. Basal dose of NPK was applied at the time of sowing. Growth and yield parameters i.e., plant height, number of branches, number of pods per plant and seed yield were compared. The rainbow and dunkled cultivars showed maximum plant height at both the sites while sultan raya and BRS-II produced more number of branches as compared to rest of the cultivars. Among all the cultivars, although, sultan raya out yielded on the basis of seed yield (1446 and 869 kg/ha) at site-1 and site-2, respectively, but there was about 40% decrease in seed yield at site-2 due to high salinity (13.02 dS/m) followed by BRS-II which showed about 45% yield reduction at the same site. Maximum oil contents were determined in the seeds of sultan raya followed by BRS-II and dunkled grown at both the sites. Generally, sultan raya maintained significantly high level of K<sup>+</sup> and less Na<sup>+</sup> in their tissues grown at both the sites. Overall, Brassica cultivar sultan raya showed promising results and better performance than rest of the cultivars at both the sites but there was a significant reduction in growth and yield of all cultivars at site-2 due to higher salinity.

**Keywords:** *Brassica* cultivars, soil salinity, growth and yield, crude protein, crude oil content, Na<sup>+</sup>, K<sup>+</sup>

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# Inheritance Studies of Morphological Characteristics in Okra (*Abelmoschus esculentus* L. Moench) Under Drought Conditions

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(received May 26, 2006; revised March 27, 2007; accepted April 6, 2007)

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**Abstract.** The present studies aimed at assessing the inheritance pattern of morphological characteristics i.e. days taken to flower, days taken to maturity, fresh fruit yield per plant, 100-seed weight and seed yield per plant of okra (*Abelmoschus esculentus* L. Moench) under normal and water stress conditions to explore drought tolerant genetic sources. Three genotypes viz. DLPG × Parbhani Karanti, No. 8 × Green Velvet and Parbhani Karanti × Green Velvet were evaluated under normal (T1) and drought (T2) conditions to assess the trend of inheritance. In T1, weekly irrigation was given and in T2 three consecutive irrigations were skipped out at flowering and podding stage. No response of water stress was observed in heterosis, inbreeding depression and potence ratio for days taken to maturity. However, the combinations exhibited differential behavior for days taken to flower, fresh fruit yield per plant, 100-seed weight and seed yield per plant of okra due to water stress.

**Keywords:** okra, inheritance studies, drought conditions

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## Short Communication

# Evaluation of the Anti-Edematogenic Activity of the Aqueous Extract of *Leea guineensis*

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(received February 24, 2006; revised December 8, 2006; accepted December 12, 2006)

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**Abstract.** The aqueous extract of *Leea guineensis* leaves was evaluated for its anti-edematogenic properties. The phytochemical studies revealed the presence of saponins and glycosides as the secondary metabolites. Using the carrageenan-induced paw oedema, there was a significant ( $P < 0.001$ ) reduction in edema. The study also revealed a dose dependent anti-edematogenic activity.

**Keywords:** carrageenan, *Leea guineensis*, anti-edematogenic activity

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# Technology

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## Enhanced *Zingiber officinale* Shoot Multiplication in Liquid Culture

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(received December 10, 2005; revised December 9, 2006; accepted December 28, 2006)

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**Abstract.** An efficient method of micropropagation of ginger (*Zingiber officinale*) that can produce 19-fold increase in plantlets after every 12 weeks from a single shoot tip has been developed. Among the various growth regulators used, a combination of 17.6  $\mu\text{M}$  6-benzylaminopurine (BA) with 2.46  $\mu\text{M}$  indole butyric acid (IBA), 0.94  $\mu\text{M}$  kinetin (Kin) and/or 11.42  $\mu\text{M}$  indole-3-acetic acid (IAA), with half and three quarter strength of Murashige and Skoog (MS) medium proved as the best for morphogenesis. An appropriate combination of cytokinin and auxin gives better results as compared to cytokinin or auxin alone. In addition to the chemical composition of the medium, its physical form can influence the growth pattern and the multiplication rate of cultures. The liquid phase enhanced effectivity of media in case of shoot multiplication. It was also noted that shoot number increased due to “agitation” factor. All the regenerated shoots had functional roots in the same media of shoot multiplication.

**Keywords:** ginger micropropagation, shoot multiplication, *in vitro*, growth regulators

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